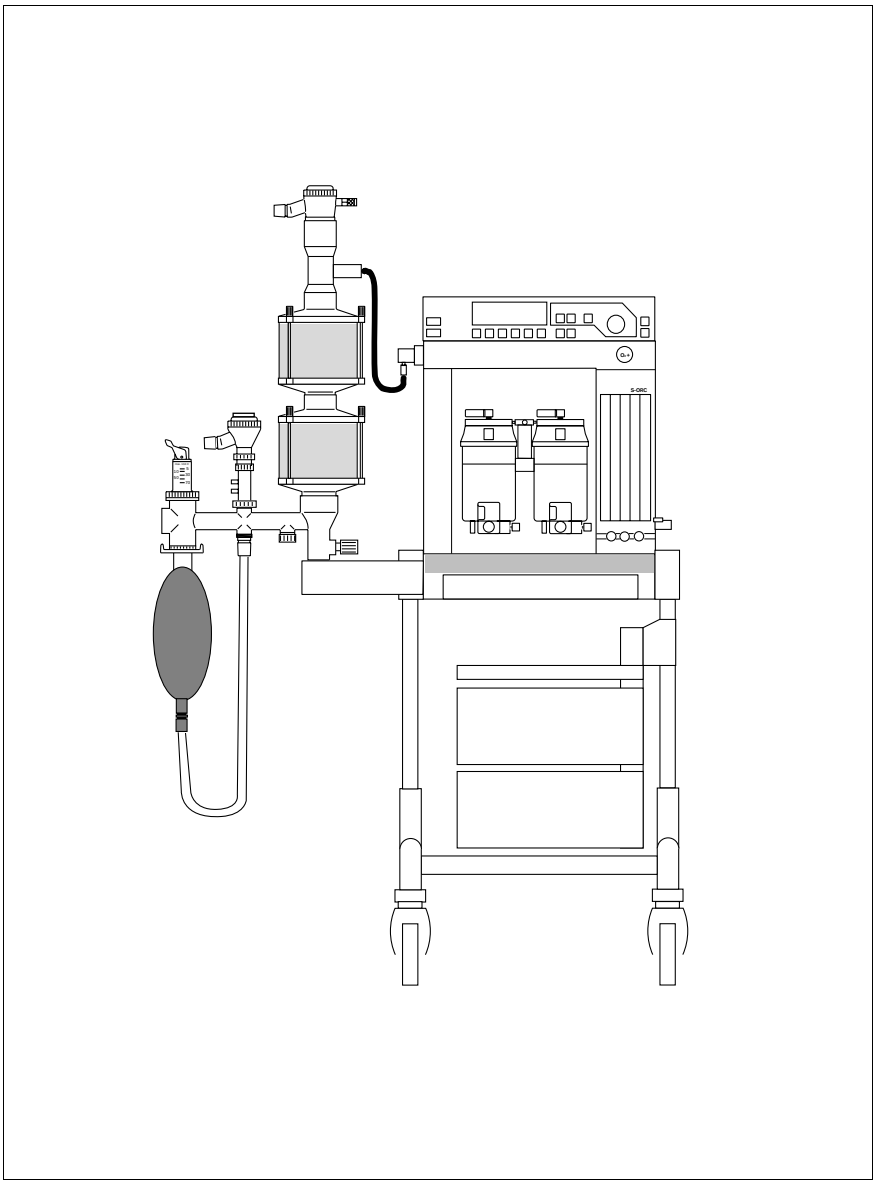
Fabius

Technical
Documentation



No replacement in event of modification.

Attention is to be paid to the Operating Manual.

This technical documentation does not replace the Operating Manual.

The warranty and liability conditions of the general terms and conditions for business transactions of Dräger Medical AG & Co. KGaA are not extended by this technical documentation.

Safety Regulations:
Reference is hereby made to the observance of the relevant safety provisions, such as the Medical Equipment Ordinance (Medizingeräteverordnung), the Pressure Container Ordinance (Druckbehälterverordnung), the Technical Rules for Pressurised Gases (Technische Regeln Druckgase) or the Occupational Health and Safety Provisions (Unfallverhütungsvorschriften).

Insofar as reference is made to laws, regulations or standards, these are based on the legal system of the Federal Republic of Germany.

Follow your local laws and regulations.

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1 General Information About Fabius

The Fabius basic unit consists of the following assemblies:

- control box
- gas box (on rear panel of Fabius)
- flowmeter block
- compact breathing system "Cosy"/circle absorption system "Circle System 9/Fabius"
- pneumatics
- ventilator (located in the swing-out part of Fabius)
- anesthetic vaporizer "Vapor 19.n"
- trolley

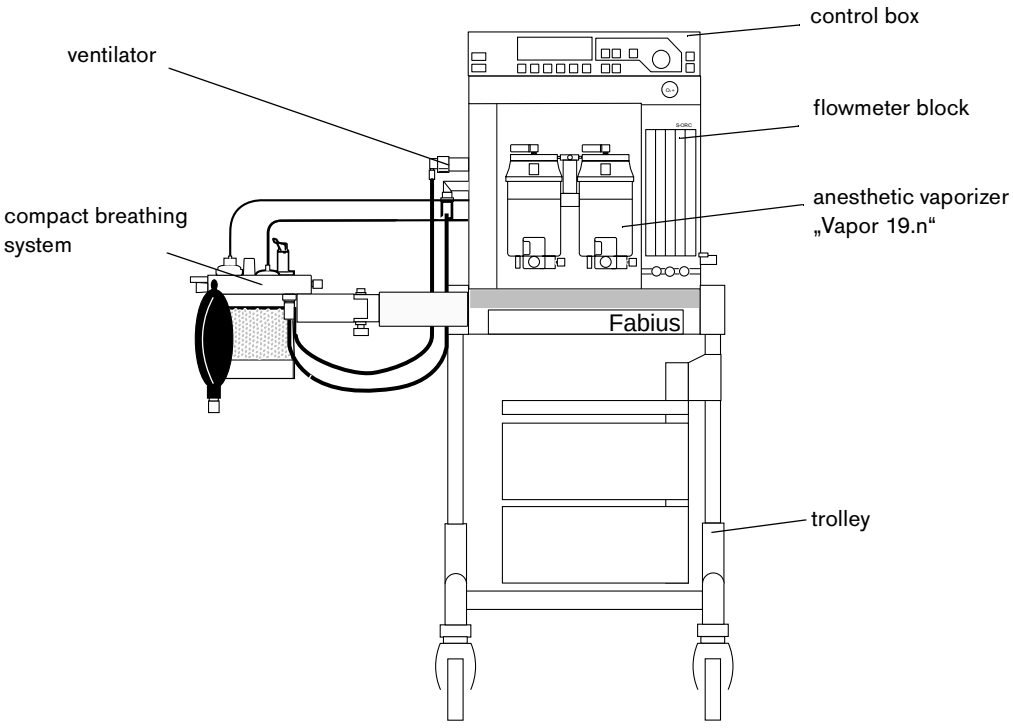


Fig. 1: Fabius equipped with a compact breathing system "Cosy"

1 About This Service Manual

This Service Manual conforms to the International Standard IEC 60601-1.

Read each step in every procedure thoroughly before beginning any test. Always use the proper tools and specified test equipment. If you deviate from the instructions and/or recommendations in this Service Manual, the equipment may operate improperly or unsafely, or the equipment could be damaged.

Use only genuine spare parts and supplies from Dräger Medical AG & Co. KGaA.

The Test List in this Service Manual does not replace inspections and servicing by Dräger Medical AG & Co. KGaA.

This Service Manual does not replace the Instructions for Use.

1.1 Definitions

This symbol is used to provide important information that, if ignored, could lead directly to a patient's or operator's injury. It is also used to provide important information that, if ignored, could lead directly to equipment damage and, indirectly, to a patient's injury.

This symbol is used to provide additional information, operating tips, or maintenance suggestions.

Inspection	=	examination of actual condition
Servicing	=	measures to maintain specified condition
Repair	=	measures to restore specified condition
Maintenance	=	inspection, service, and repair, where necessary

2 For Your Safety and that of Your Patients

2.1 Strictly Follow the Instructions for Use

This service manual does not replace the Instructions for Use. Any use of the device requires full understanding and strict observation of the Instructions for Use. The device should only be used for the purposes specified in the section "Intended Use".

2.2 Maintenance

The device must be inspected and maintained regularly by trained service personnel at six month intervals (and these recorded).

Repair and general overhaul of the device may only be carried out by trained service personnel. We recommend that a service contract be obtained with DrägerService® and that all repairs also be carried out by DrägerService. Only Dräger spare parts may be used for maintenance.

Follow the instructions given in the section "Maintenance Intervals".

2.3 Not for Use in Explosion-Hazard Areas

This device is neither approved nor certified for use in areas where combustible or explosive gas mixtures are likely to occur.

2.4 Safe Connection with Other Electrical Equipment

Electrical connections to equipment which is not listed in the Instructions for Use should only be made following consultations with the respective manufacturers or an expert.

2.5 Liability for Proper Functioning or Damage

Liability for the device's proper functioning is irrevocably transferred to the owner or operator if the device is serviced or repaired by personnel not employed or authorized by DrägerService or if the device is used in a manner not conforming to its intended use.

Dräger Medical AG & Co. KGaA cannot be held responsible for damage caused by non-compliance with the recommendations given above. The warranty and liability provisions of the terms of sale and delivery of Dräger Medical AG & Co. KGaA are likewise not modified by the recommendations given above.

Dräger Medical AG & Co. KGaA

3 Intended Use

Fabius® is an inhalation anesthesia machine with continuous fresh-gas flow for patients with a body weight of 5 kg and over.

Fabius is intended for use in operating theatres and induction and recovery rooms. It can be used with O_2, N_2O, and (optional) AIR supplied from a central supply system and/or from medical gas cylinders.

Fabius is fitted with the circle absorption system "Circle System 9/Fabius". This circle absorption system is a partial rebreathing system which provides fresh-gas decoupling, PEEP (positive end-expiratory pressure), and pressure limitation.

Fabius offers the following ventilation modes:

- IPPV (Intermittent Positive Pressure Ventilation)
- MAN (Manual Ventilation)
- SPONT (Spontaneous Breathing)

Fabius is equipped with an electrically driven and electronically controlled ventilator. The control unit (control box) monitors the airway pressure (Paw), the flow, and the O_2 concentration.

The anesthetic vaporizer "Vapor 19.n®" enriches the fresh gas with anesthetics.

Risk of explosion in the presence of flammable anesthetics such as ether or cyclopropane!
Do not use the machine in the presence of flammable anesthetics.

Risk of Infection! To avoid infections, clean and disinfect Fabius and its components/accessories according to approved hospital procedures before servicing or shipping for repair.

Risk of personal injury! Excessive CO_2 and/or anesthetic concentrations could lead to a patient's injury.
Use CO_2 and anesthetic monitors.

Risk of burns if antistatic or electrically conductive breathing tubes are used in combination with high-frequency surgery equipment.
Do not use antistatic or electrically conductive breathing tubes in combination with high-frequency surgery equipment.

Risk of malfunction in nuclear spintomography environment!
Do not use the machine in conjunction with nuclear spintomography (MRT, NMR, or NMI).

Risk of malfunction! Radio communication devices may cause malfunction in electrical medical devices.
Do not use wireless or cellular phones within 10 meters of electrical medical devices.

3.1 Safety Features

Fabius includes the following safety features:

- monitoring of airway pressure (Paw), flow (V), and fraction of inspired O_2 (FiO_2)
- built-in O_2 shortage alarm and N_2O cut-off
- built-in sensitive oxygen ratio controller (S-ORC) (a control device which ensures a minimum O_2 concentration of 21 vol.% in the respiratory air)

4 Decontamination

4.1 Removing Components Before Decontamination

The following components must be removed from Fabius before starting decontamination:

- breathing bag and breathing hose
- Y-piece
- breathing hoses
- corrugated hose between adapter and ventilator
- fresh-gas hose (disconnect from circle absorption system)
- pressure-measuring hose including bacterial filter
- PEEP control hose (disconnect from expiratory valve only)
- flow-sensor measuring hoses (disconnect from rear panel of control box only, do not disconnect from flow sensor)
- circle absorption system (disconnect from hinged arm)
- ventilator's bag rolling diaphragm

4.2 General Information about Cleaning/Disinfection

Risk of damage to materials! Disinfectants based on phenols, halogen-releasing compounds, strong organic acids, O_2-releasing compounds can damage materials. Do not use disinfectants based on phenols, halogen-releasing compounds, strong organic acids, O_2-releasing compounds.

Risk of damage to materials! When cleaning/disinfecting the following components in a washing/disinfection machine use only detergents. Do not add disinfectants as they may cause corrosion.

Risk of malfunction and/or damage to materials! Do not disinfect the bacterial filter. Do not disinfect or sterilize the O_2 sensor. Do not expose the O_2 sensor to temperatures higher than 60 °C.

Use only agents classified as surface disinfectants for disinfection. For material compatibility, we recommend agents based on aldehydes, alcohol, or quaternary ammonium compounds.

Always follow the manufacturer's directions specifically with respect to safe handling, prescribed concentrations and the necessary exposure times.

4.3 Wipe-Disinfection

- Wipe-disinfect the following components:
  - Fabius housing and trolley
  - anesthetic vaporizer "Vapor 19.n"
  - compressed-gas hoses
  - fresh-gas hose
  - O_2 sensor

4.4 Cleaning/Disinfection in a Washing/Disinfection Machine

Risk of damage to materials! When cleaning/disinfecting the following components in a washing/disinfection machine use only detergents. Do not add disinfectants as they may cause corrosion.

- Clean/disinfect the following components with moist heat at 93 °C for 10 minutes:
  - breathing hoses
  - all parts of the circle absorption system "Circle System 9/Fabius" (except O_2 sensor)
  - ventilator housing
  - bag rolling diaphragm in the ventilator
  - flow sensor including flow-measuring hoses

4.5 Procedures before Sterilization

- Mount the following components (except O_2 sensor) onto the circle absorption system before you sterilize the circle absorption system:

– inspiratory valve

– expiratory valve

– absorber(s)

4.6 Sterilization

- Sterilize the following components in hot steam at 134 °C:

– breathing hoses

– all parts of the circle absorption system "Circle System 9/Fabius" (except O_2 sensor)

– ventilator housing

– bag rolling diaphragm in the ventilator

– flow sensor including flow-measuring hoses

4.7 Reassembling Components

- Reassemble all cleaned/disinfected/sterilized components.
- Mount all components onto Fabius.

4.8 Preparing Fabius for Use

- Connect Fabius to the mains power supply.
- Connect Fabius to the gas supplies.
- Perform checks of readiness for operation (see "Tests of Readiness for Operation" on page 16).

5 Tests of Readiness for Operation

Perform tests of readiness for operation after each care procedure.

- Before starting the tests, make sure the machine is completely re-assembled, the CO_2 absorbers are (re-)filled, and Fabius is connected to the central supply system and/or to medical gas cylinders.
- Calibrate the flow sensor.
- Calibrate the O_2 sensor.

5.1 Testing the Medical Gas Connections

- Make sure all hoses to the central supply system and/or to the medical gas cylinders are connected securely.
- Make sure all hoses to the central supply system and/or to the medical gas cylinders are free from leaks.

5.2 Testing the Flowmeters

- Adjust the O_2 flow control valve to 9 L/min.

The float of the O_2 flowmeter should indicate 9 L/min.

- Adjust the O_2 flow control valve to 1.5 L/min.
- Adjust the N_2O flow control valve to maximum.

The float of the N_2O flowmeter should be between 3 L/min and 5 L/min.

- Disconnect the O_2 supply connector from the terminal unit or, if Fabius is connected to an O_2 cylinder, close the O_2 cylinder valve.

The O_2 shortage alarm should sound. The float of the N_2O flowmeter should descend to 0 L/min.

- Connect the O_2 supply connector to the terminal unit or, if Fabius is connected to an O_2 cylinder, open the O_2 cylinder valve.

The N_2O flow should continue.

The O_2 shortage alarm is ready to operate again as soon as the operating pressure exceeds 2.7 bar for 20 seconds and no O_2 is used during this period.

- Adjust the AIR flow control valve to 14 L/min.

AIR should flow.

- Close all flow control valves.

5.3 Testing the Gas Type

- Switch on Fabius.
- Select the IPPV mode.
- Disconnect the fresh-gas hose from the fresh-gas output port.
- Adjust the O_2 flow control valve to 3 L/min (leave the other flow control valves closed).
- Unscrew the O_2 sensor assembly from its mount.
- Place the O_2 sensor assembly in the fresh-gas flow near the fresh-gas output port.

The fraction of inspired O_2 (FiO_2) should be about 100 vol.% (the FiO_2 is displayed on the control box).

- Adjust the N_2O flow control valve to 3 L/min.

The fraction of inspired O_2 (FiO_2) should decrease to about 100 vol.% (the FiO_2 is displayed on the control box).

- Close the O_2 flow control valve.
- Close the N_2O flow control valve.
- Screw the O_2 sensor assembly onto the inspiratory valve.
- Connect the fresh-gas hose to the fresh-gas output port.

5.4 Testing for Leaks

Test for leaks once **with** and once **without** the anesthetic vaporizer "Vapor 19.n" fitted. When the anesthetic vaporizer is fitted, set its handwheel to 0 (zero).

- Select the MAN/SPONT mode.
- Disconnect the breathing bag.
- Disconnect the connector.
- Connect the free end of the breathing hose to the Y-piece.
- Switch the adjustable pressure limiting valve (APL valve) to MAN.
- Adjust the APL valve to 70 mbar (hPa).
- Press and hold the O_2 flush button until a pressure of 25 hPa to 30 hPa is reached (the pressure is displayed on the control box).
- Adjust the O_2 flow control valve to 0.12 L/min.

The pressure (measured at the inspiratory valve on the circle absorption system "Circle System 9/Fabius") should increase or remain steady.

- Close the O_2 flow control valve.
- Disconnect the breathing hose from the Y-piece.

If the leak test has not been completed successfully (pressure decreases):

- Remove any sodalime residues from the absorber connectors.
- Check the connector of the airway pressure measuring hose at the inspiratory valve and all screw connections for leaks.
- Replace any missing or damaged seals (contact DrägerService, if necessary).
- Repeat the step "Testing for Leaks" on page 18.

5.5 Testing the O_2 Flush Function

- Press and hold the O_2 flush button (do not seal the Y-piece).

Gas should flow through the Y-piece.

- Release the O_2 flush button.

No gas should flow through the Y-piece.

5.6 Testing the Ventilator

- Make sure the adapter is connected to the ventilator.
- Check the hose connection between the ventilator and the expiratory valve.
- Select the IPPV mode.
- Connect the breathing bag to the Y-piece.

Fabius should now build up the ventilation pressure. The breathing bag should inflate during the inspiration phase and deflate during the expiration phase.

- Check the function of the ventilator piston (visual check).

The ventilator piston should ascend and descend.

- Check the valve discs of the ventilator for leaks (visual check).

5.7 Testing the Circle Absorption System "Circle System 9/Fabius"

- Make sure the fresh-gas hose is in a perfect condition.
- Make sure the fresh-gas connections are in a perfect condition.
- Check the function of the inspiratory valve (visual check).
- Check the function of the expiratory valve (visual check).

The breathing bag should inflate/deflate.

- Switch off Fabius using the ON/OFF switch.

5.8 Testing the Anesthetic Vaporizer "Vapor 19.n"

- Check the filling level of the anesthetic vaporizer; refill if necessary.
- Check the anesthetic vaporizer function as described in the relevant Instructions for Use.

5.9 Testing the Function of the Anesthetic-Gas Scavenging System

- Check the hose connection at the anesthetic-gas scavenging port.
- Connect the probe of the anesthetic-gas scavenging hose to the vacuum wall terminal unit.

If the indicator on the wall terminal unit is “green”, the anesthetic-gas scavenging system is activated (Note: This applies only to Dräger central gas supply and vacuum systems. If Fabius is connected to another anesthetic-gas scavenging system, check the direction of the flow).

5.10 Testing Emergency Ventilation with the Breathing Bag

- Squeeze the breathing bag.

When the breathing bag is squeezed, it should be possible to feel and hear an air flow through the mask connector.

When the breathing bag is released, it should return to its previous (filled) shape.

- Seal the mask connector with your thumb.

It should only be possible to squeeze the breathing bag a little.

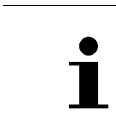
5.11 Testing the Monitoring Functions

You can test the monitoring functions by setting the alarm limits such that an alarm is generated.

- Test the FiO_2 monitoring.
- Test the flow monitoring.
- Test the airway pressure monitoring.

5.12 Testing Additional Monitors/Analyzers

- Test the CO_2 monitor.
- Test the anesthetic agent analyzers.



Fabius is ready for use if all tests have been completed successfully.

6 Specifications

6.1 Operating Parameters

Rated voltage	220 VAC to 240 VAC (±10%), 50/60 Hz, 0.7 A or 100 VAC to 127 VAC (+10%, –15%) 50/60 Hz, 1.4 A
Fuses	2 x T1 AL 250 V, IEC 127/III

6.2 Ambient Conditions for Operation

Temperature	+15 °C to +35 °C
Atmospheric pressure	700 hPa to 1060 hPa (mbar)
Relative humidity	20% to 80%

6.3 Ambient Conditions for Storage

Temperature	–10 °C to +60 °C
Atmospheric pressure	500 hPa to 1060 hPa (mbar)
Relative humidity	0% to 80%

6.4 Rechargeable Batteries of the Uninterruptible Power Supply (UPS)

Make sure the rechargeable batteries of the UPS do not discharge completely.

If the mains power fails, Fabius continues operation without interruption. The message “BATTERY POWERED” appears on the display of the control box at 5-minute intervals.

Voltage **Current**	24 V 3.5 Ah
Operating time at fully charged batteries	at least 1.5 h
Recharging time	At least 4 h (with Fabius connected to mains supply and switched on) to reach full back-up time.

6.5 Gas Supply from a Central Supply System

Pressure at Fabius connectors for O_2, N_2O, AIR	270 kPa to 550 kPa
Type of connectors	NIST

6.6 Gas Supply from (optional) O_2 and N_2O Cylinders

Pressure at Fabius connectors for O_2, N_2O All gas connectors are equipped with non-return valves.	500 kPa

6.7 Fresh-Gas Output Port

Fresh-gas output port	connector cone 22 ISO connector cone 15 ISO (+ thread to secure)

6.8 Gas Flow Control

Fresh-gas flow	
O_2 flowmeters (calibrated at 20 °C, 1013 hPa)	0.02 L/min to 0.5 L/min (±10%) 0.55 L/min to 10.0 L/min (±10%)
N_2O flowmeters (calibrated at 20 °C, 1013 hPa)	0.02 L/min to 0.5 L/min (±10%) 0.02 L/min to 0.5 L/min (±10%)
AIR flowmeters (optional)	0.2 L/min to 12 L/min
O_2 flush (bypass)	volume supplied at 500 kPa: maximum 70 L/min at 270 kPa: minimum 28 L/min
Pressure limitation	80 kPa (±5 kPa)
O_2 output port for secretion suction (ejector)	300 kPa to 500 kPa (self-locking coupling) maximum 20 L/min

6.9 Anesthetic Agent Flow Control

Anesthetic vaporizer "Vapor 19.n" plug-in system for 2 anesthetic vaporizers	Connectors are automatically closed and sealed to atmosphere when the anesthetic vaporizer is detached.
Technical data:	
Halothane anesthetic vaporizer "Vapor 19.n"	See relevant Instructions for Use.
Enflurane anesthetic vaporizer "Vapor 19.n"	See relevant Instructions for Use.
Isoflurane anesthetic vaporizer "Vapor 19.n"	See relevant Instructions for Use.
Sevoflurane anesthetic vaporizer "Vapor 19.n"	See relevant Instructions for Use.
Desflurane anesthetic vaporizer "Devapor"	See relevant Instructions for Use.

6.10 Ventilator Specifications

Tidal volume (V_T)	50 mL to 1400 mL ±max (5%; 20 mL) no compliance correction of breathing system
Ventilation frequency (f)	6 to 60 1/min (±1 1/min)
Positive end-expiratory pressure (PEEP)	0; 2 hPa to 15 hPa (±2 hPa or ±20%)
Inspiratory pause time to inspiratory time ratio (T_{IP}/T_I)	5% to 50% (±100ms)
Inspiratory to expiratory time ratio (T_I/T_E ratio)	1/3 to 2/1 (±100ms)
Maximum pressure limit (Pmax)	10 hPa to 70 hPa (±5 hPa)
APL valve MAN position SPONT/IPPV position	 5 hPa to 70 hPa (±15%) 1.5 (±1 hPa)

6.11 Breathing System

Volume	2.5 L + breathing bag
Compliance	1.25 mL/hPa in IPPV mode
Absorber volume	1000 mL for 1 absorber

Breathing system resistance:

	at a flow of 5 L/min	at a flow of 30 L/min	at a flow of 60 L/min
Inspiratory resistance	0.3 hPa	1.0 hPa	2.3 hPa
Expiratory resistance	0.4 hPa	1.8 hPa	3.5 hPa

6.12 Electromagnetic Compatibility (EMC)

Electromagnetic compatibility	complies with IEC 60 601-1-2

6.13 Dimensions and Weight

Dimensions (W x H x D) (with 1 absorber)	960 mm x 1280 mm x 620 mm
Weight	82 kg (without gas cylinders)

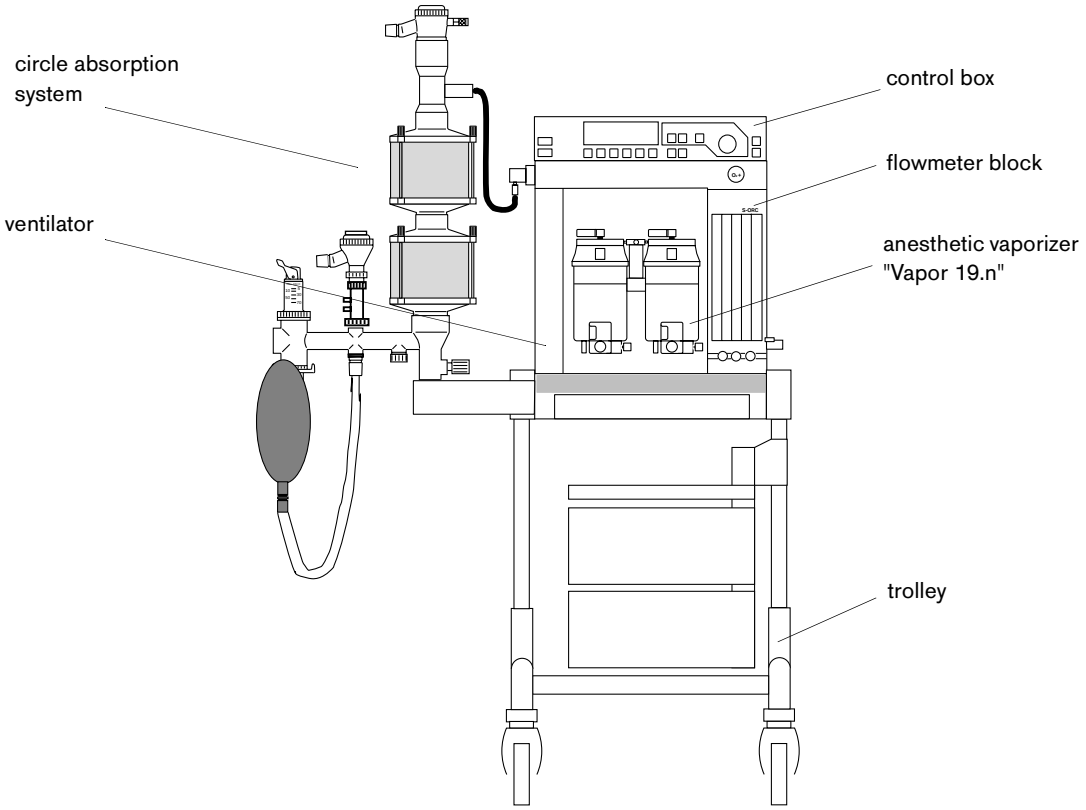


Fig. 2: Fabius equipped with a circle absorption system "Circle System 9 Fabius"

Fabius provides connections for the following medical gas cylinders:

- O_2 cylinder
- N_2O cylinder

Fabius can be retrofitted with the following assemblies/functions:

- drawer assembly
- rechargeable batteries for uninterruptible power supply (UPS)
- additional gas (AIR)
- cylinder set mount

2 Fabius Function Diagrams

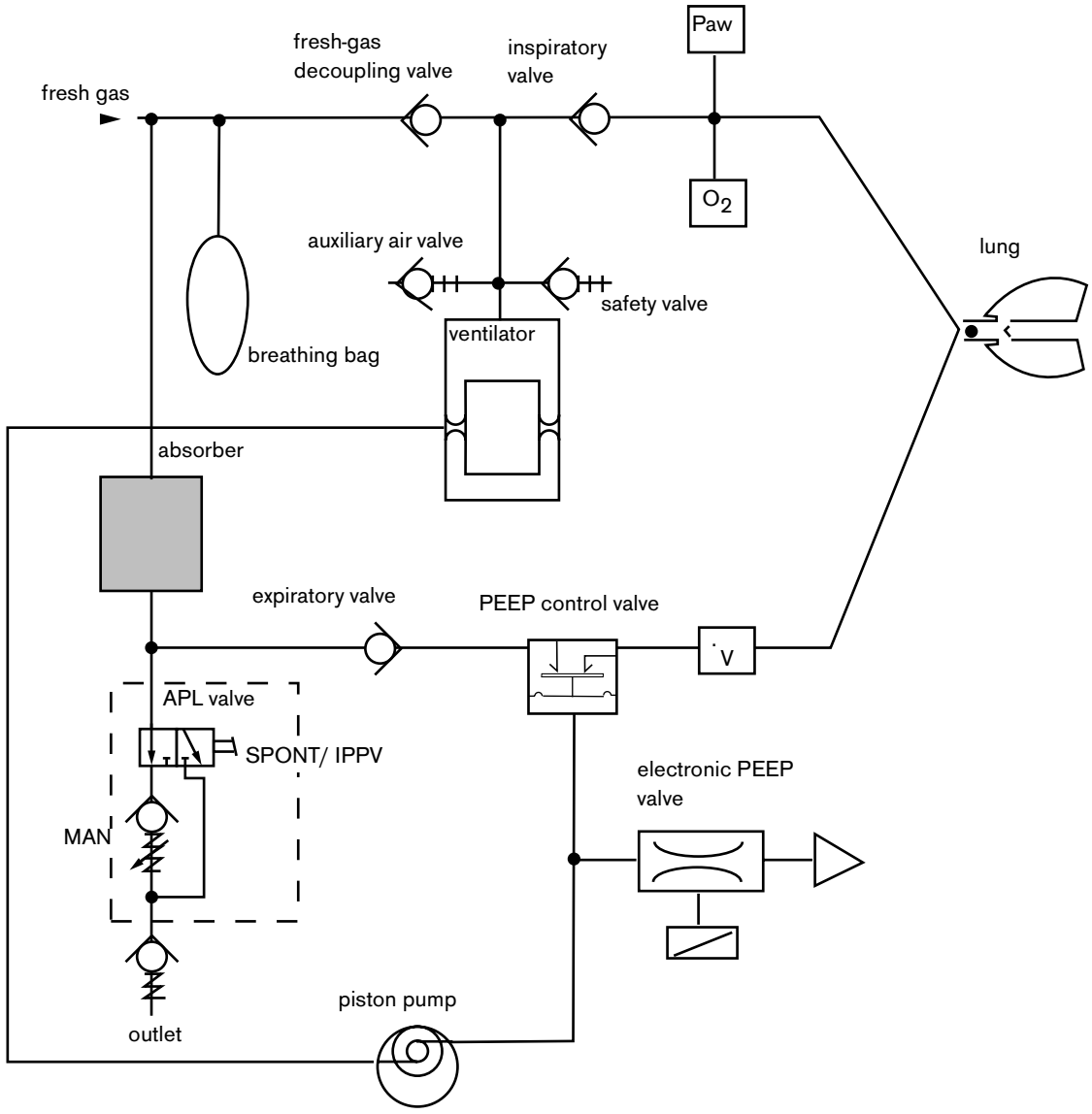


Fig. 3: Function diagram of Fabius with compact breathing system "Cosy"

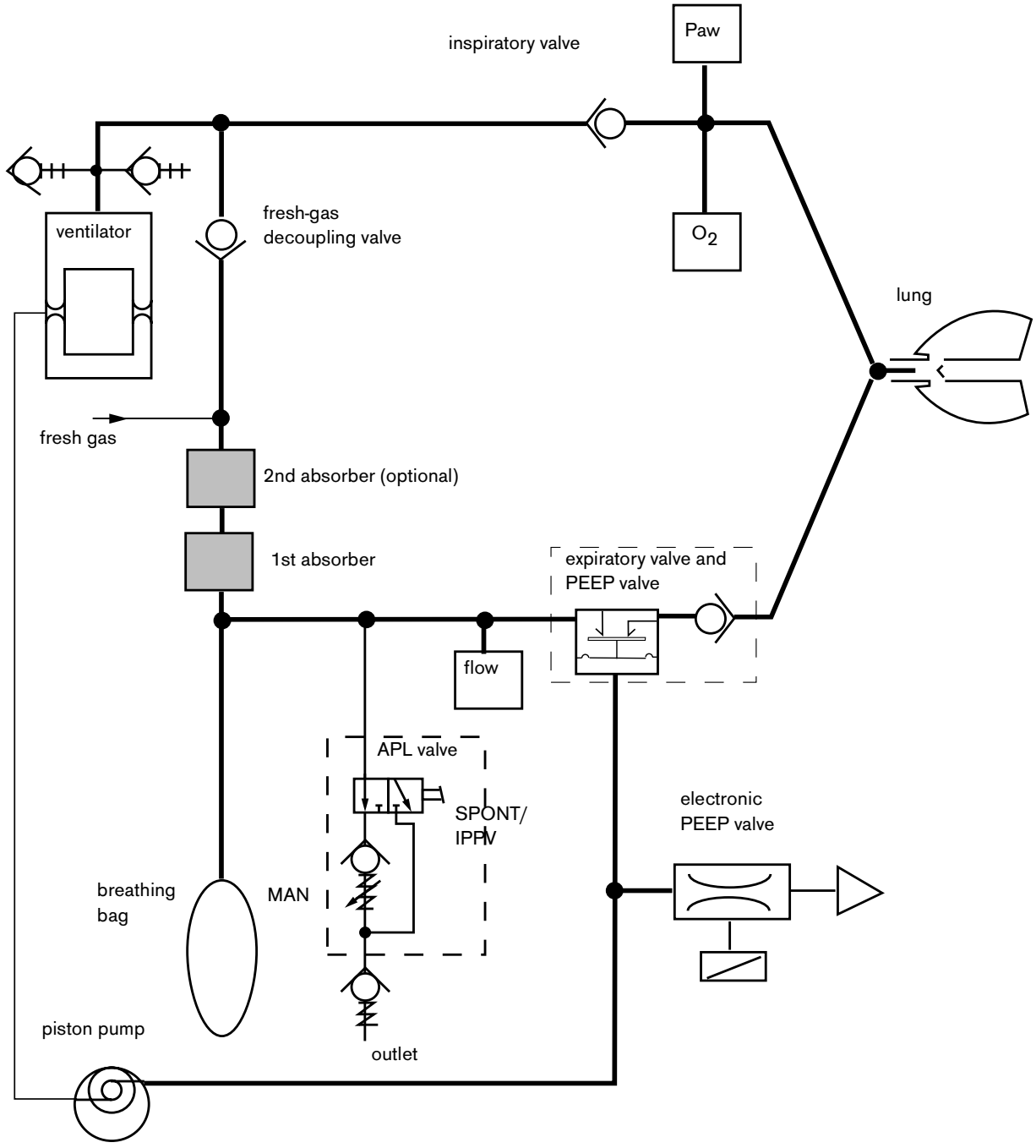


Fig. 4: Function diagram of Fabius with circle absorption system "Circle System 9 Fabius"

2.1 Optional Uninterruptible Power Supply (UPS)

The uninterruptible power supply (UPS) consists of two rechargeable batteries. These rechargeable batteries are connected in series thus providing a total voltage of 24 V. The UPS is charged during the operation phases. In the event of a voltage drop or a complete power failure, the UPS can backup operation for approx. 60 minutes. The UPS is located in the gas box. Connection is made on the rear panel of the control box.

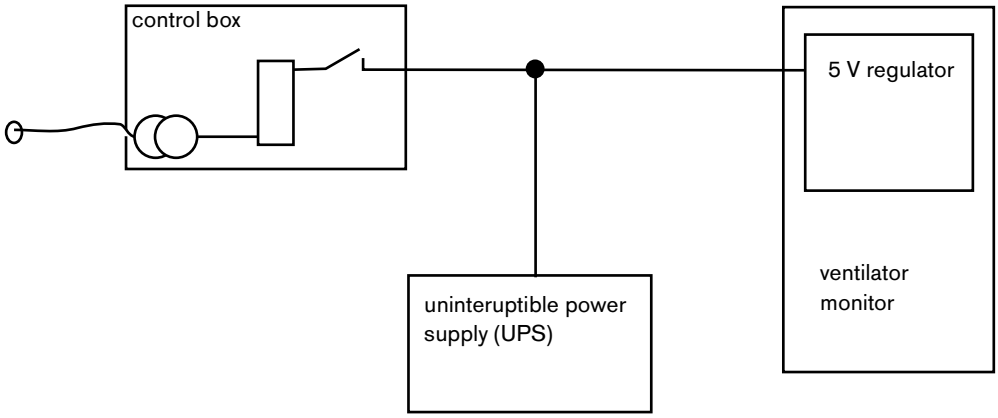


Fig. 5: Block diagram of Fabius' voltage supply

3 Function Diagram (2-gas version)

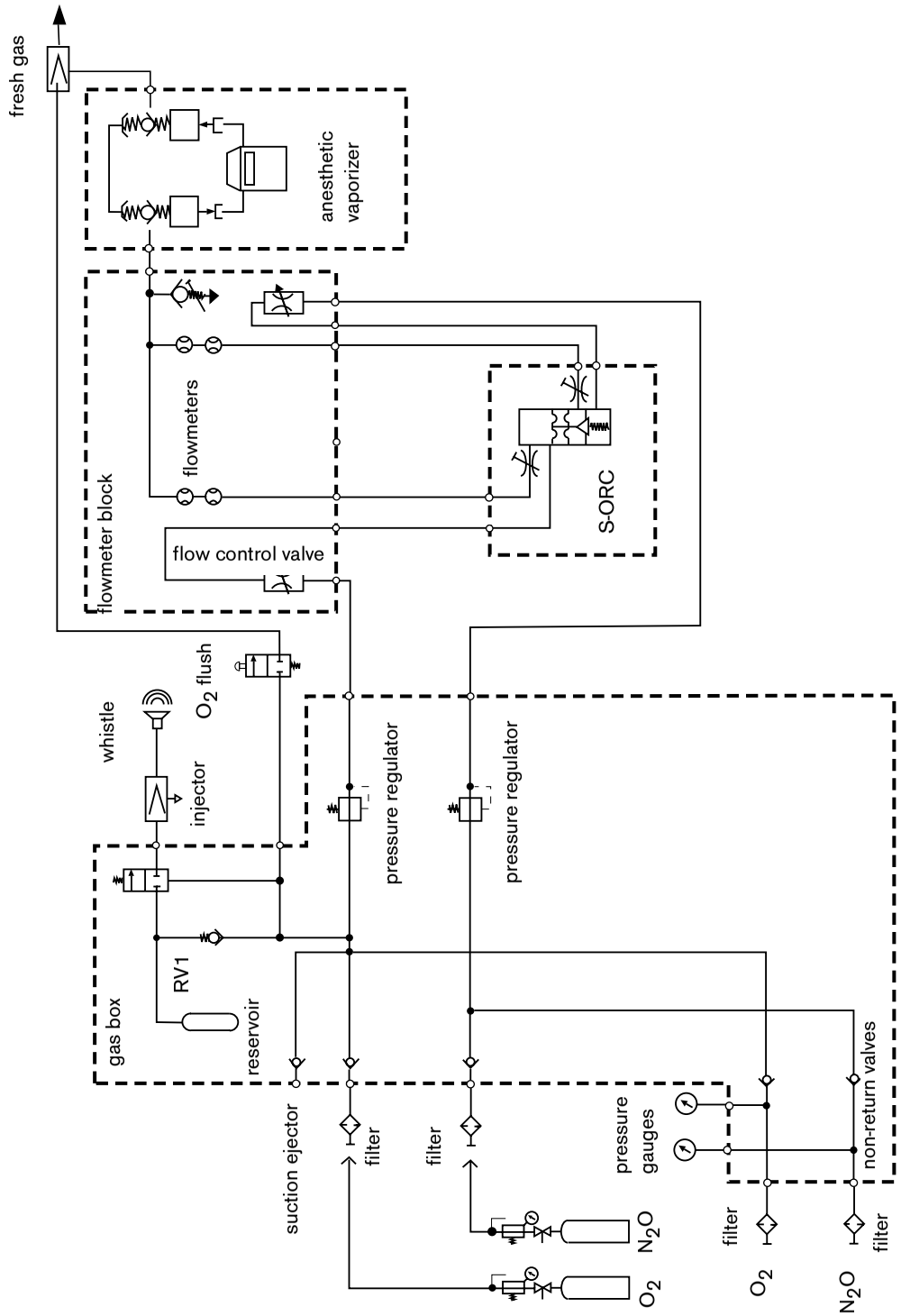


Fig. 6: Function Diagram (2-gas version)

4 Function Diagram (3-gas version)

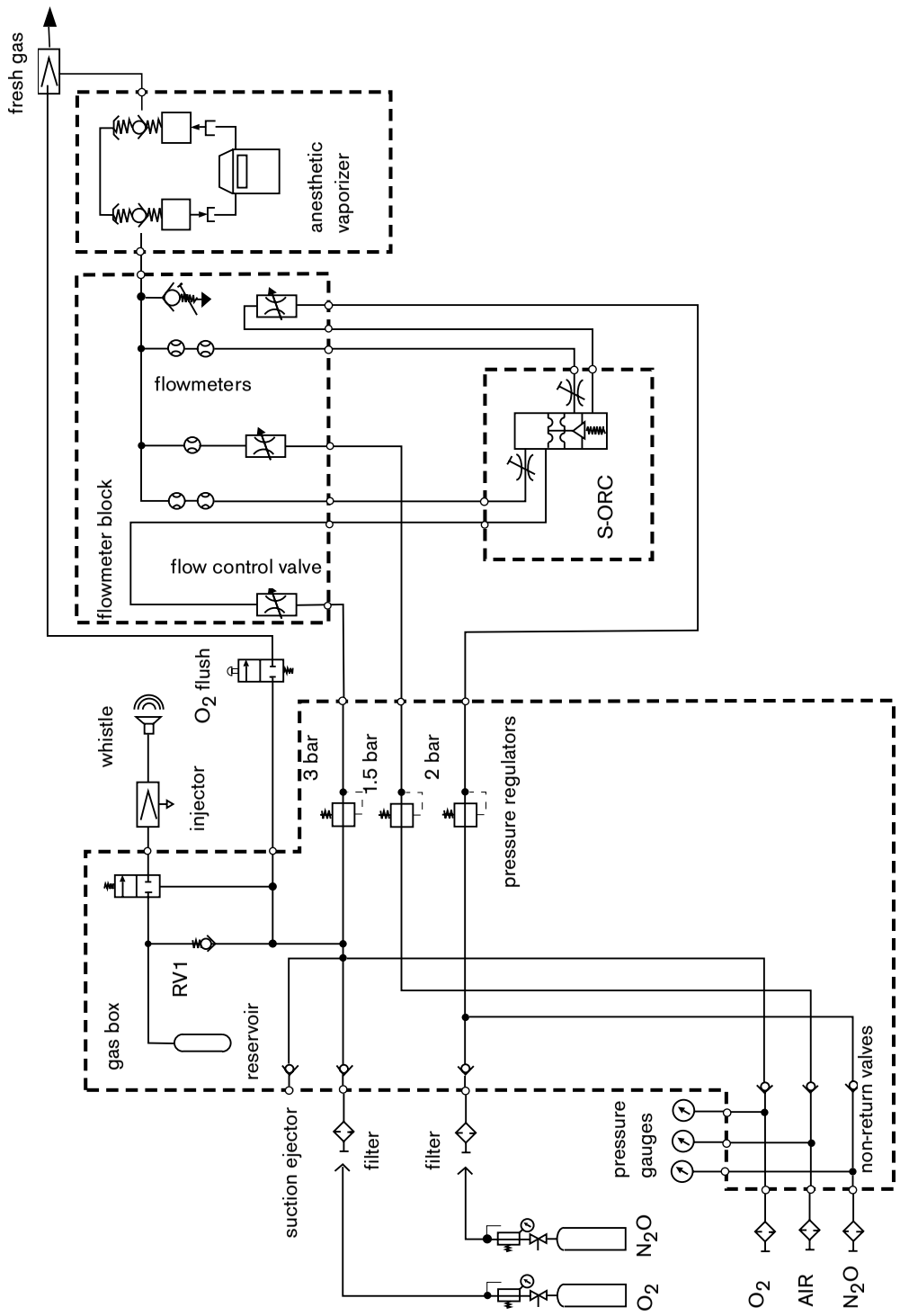


Fig. 7: Function Diagram of the Fabius (3-gas version)

5 Function Description of the Gas Box

The supply gases flow through the built-in filters of the compressed-gas connections and are then available at the pressure gauges. The pressure gauges indicate the current pressure of the supply gases. The non-return valves prevent a reverse flow. The pressure of the supply gases is reduced by pressure regulators. The low-pressure supply gases then flow to the flowmeter block. As soon as the O_2 supply gas has reached a sufficient pressure, it flows through the spring-loaded non-return valve RV 1 and fills the reservoir.

If the O_2 supply fails or if the pressure of the O_2 supply gas decreases below a certain value, the 2-way valve switches over. The gas stored in the reservoir flows through the 2-way valve and the injector and activates the whistle (audible O_2-failure alarm).

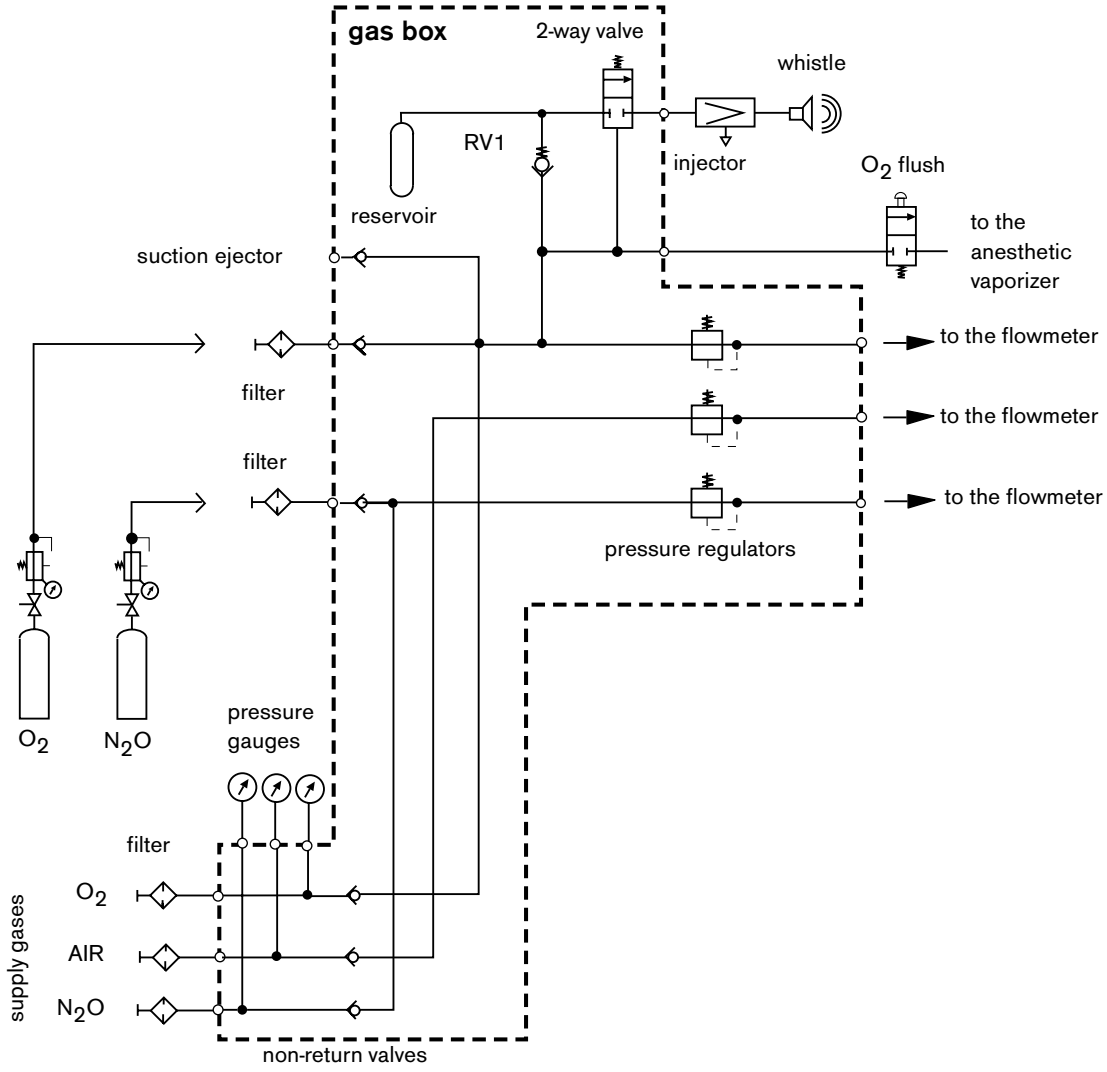


Fig. 8: Function diagram of the gas box (3-gas version), part 1

If the O_2-flush button is pressed, the fresh-gas ejector prevents the fresh gas from flowing back into the anesthetic vaporizer. This avoids an increase in the anesthetic gas concentration.

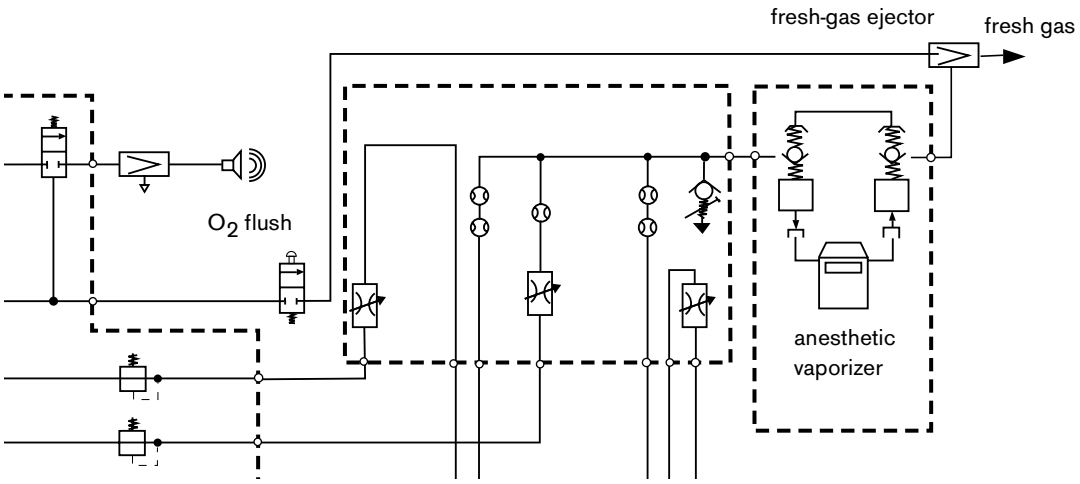


Fig. 9: Function diagram of the gas box (3-gas version), part 2

5.1 S-ORC (Sensitive Oxygen Ratio Controller)

The S-ORC is a control element that functions like an N_2O shut-off device and ensures a vital O_2 concentration in the fresh gas. In the event of an O_2 shortage, the S-ORC limits the N_2O flow such that the O_2 concentration in the fresh gas does not decrease below 21 vol.%. For the S-ORC to function properly O_2 and N_2O must have different pressures.

If the O_2 flow control valve is closed or if the O_2 flow is lower than or equal to 200 mL/min, the S-ORC interrupts the N_2O flow.

N_2O can be added as of an O_2 flow of approx. 300 mL/min. In this case, the S-ORC also prevents O_2 concentrations below 21 vol.%.

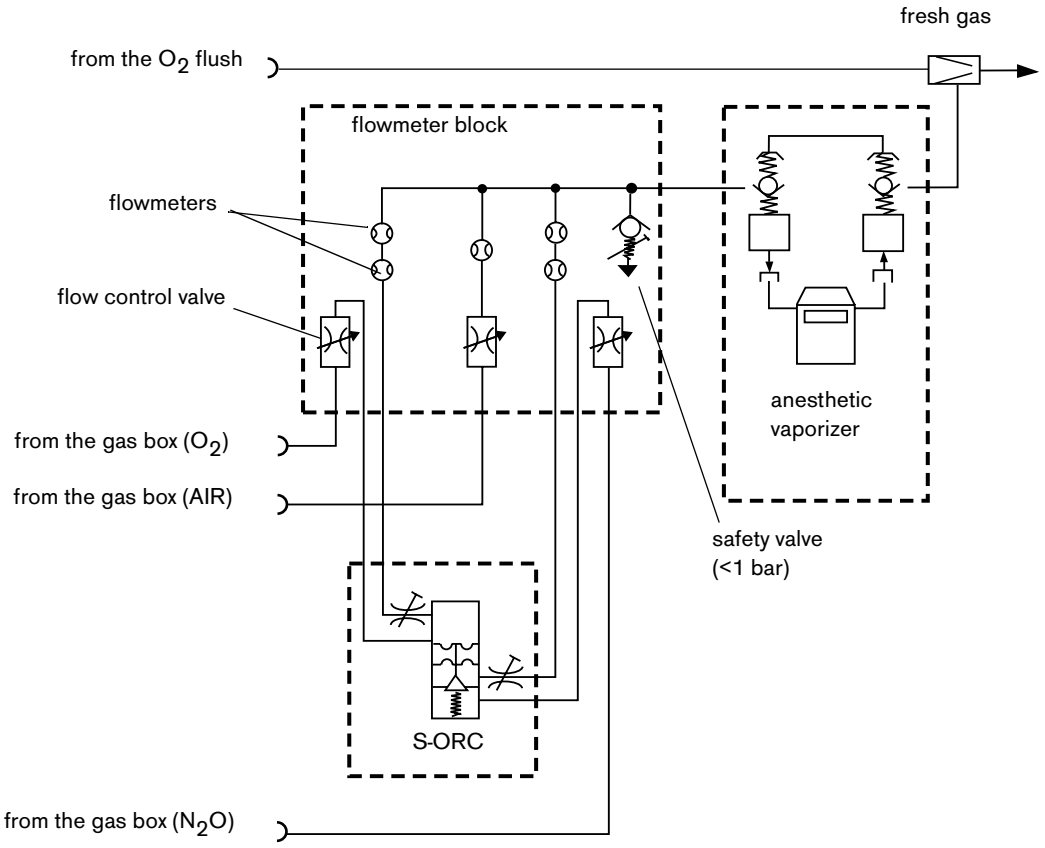


Fig. 10: S-ORC function diagram, part 1

The flow control valves are used to adjust the O_2 and N_2O flows.

Restrictors located at the outlets of the S-ORC generate back-pressures. These back-pressures exert a force on the control diaphragms of the S-ORC. The O_2 back-pressure opens the S-ORC. The N_2O back-pressure closes the S-ORC. The pressure ratio at the control diaphragm affects the N_2O flow.

The restrictors and the spring tension are dimensioned such that a minimum concentration of 21 vol.% O_2 is always ensured. The maximum O_2 flow is approx. 9 L/min.

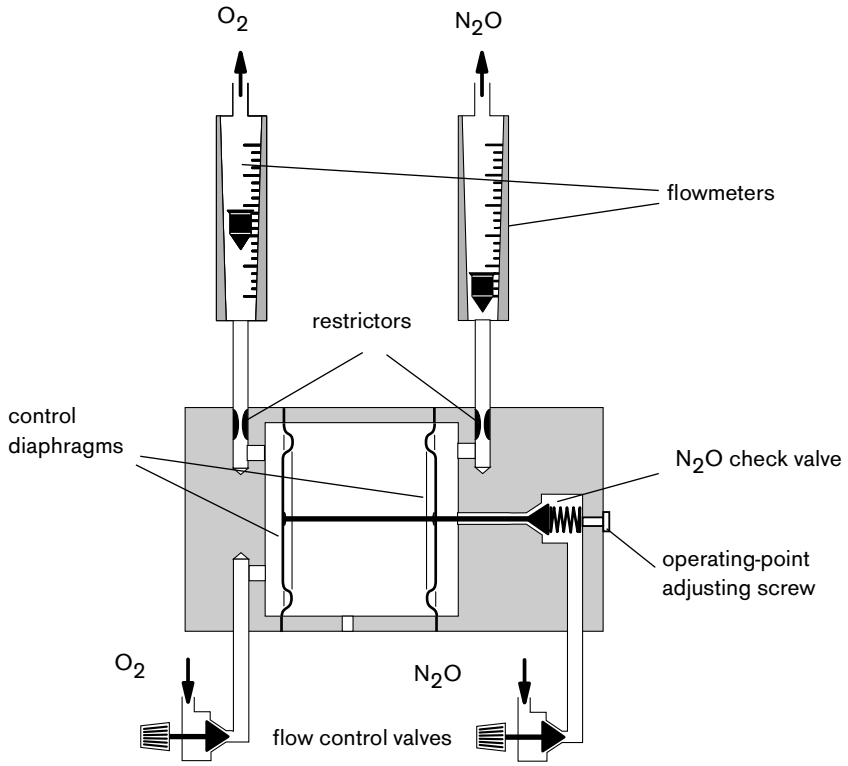


Fig. 11: S-ORC function diagram, part 2

6 Compact Breathing System "Cosy" / Circle Absorption System "Circle System 9 Fabius"

Fabius is either equipped with a compact breathing system "Cosy" or with a circle absorption system "Circle System 9 Fabius". They have the same function.

6.1 Compact Breathing System "Cosy"

The compact breathing system "Cosy" allows three modes of patient ventilation: manual ventilation, spontaneous breathing, intermittent positive pressure ventilation (IPPV). The APL valve (adjustable pressure limiting valve) has a selector which can be used to toggle between "MAN" and "IPPV/SPONT".

In the "MAN" position, the compact breathing system is closed to atmosphere. This position is the default position for manual ventilation of the patient. The APL valve opening pressure can be adjusted from 5 to 70 hPa (mbar).

In the "IPPV/SPONT" position the APL valve is open to atmosphere. This position is the default position for intermittent positive pressure ventilation and spontaneous breathing.

The pressure limit (Pmax) can also be adjusted during IPPV from 20 hPa (mbar) to 70 hPa (mbar) using the control box.

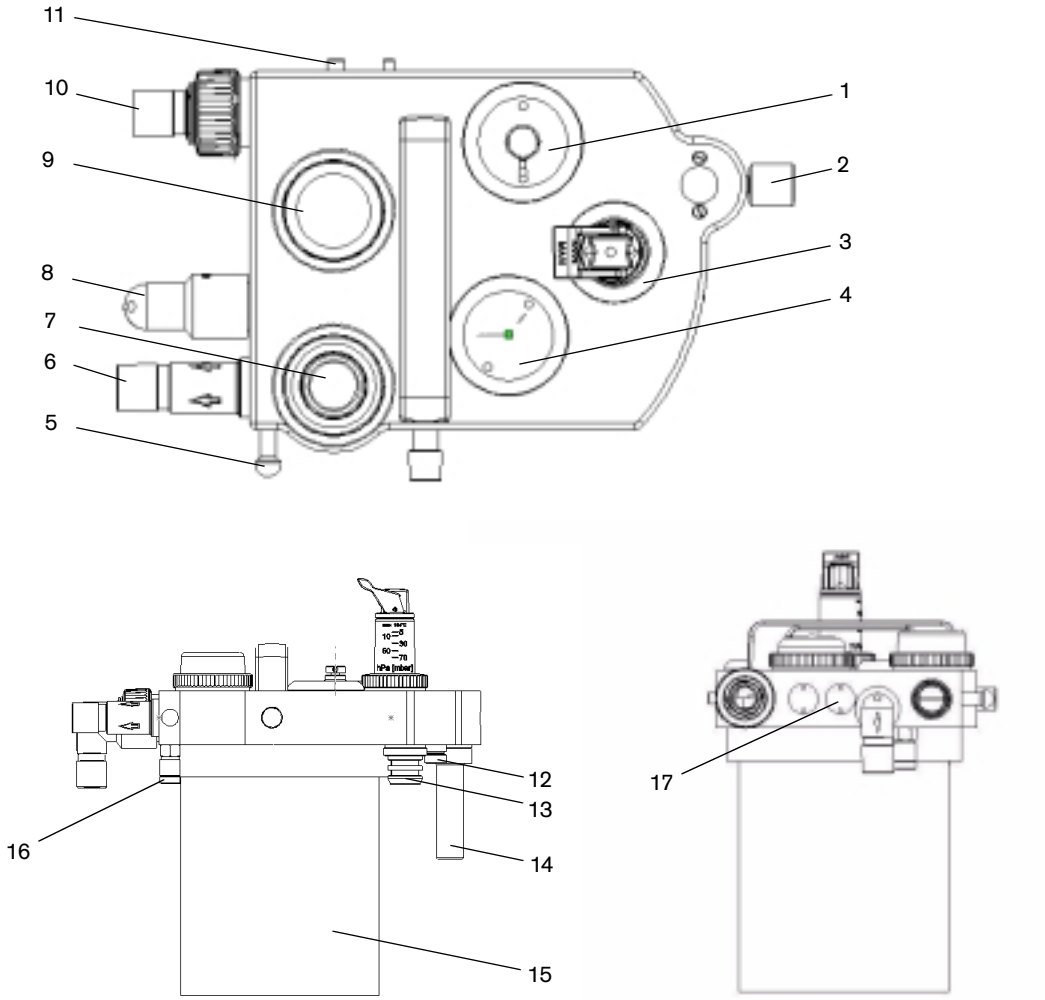


Fig. 12: Compact breathing system "Cosy"

Key

1	PEEP valve/PEEP control port	9	Expiratory valve
2	Clamping screw	10	Expiratory port
3	MAN/SPONT-IPPV selector	11	Flow sensor
	(APL valve)	12	Fresh-gas port
4	Fresh-gas decoupling valve	13	Ventilator port
5	Breathing bag mount	14	Anesthetic gas scavenging port
6	Inspiratory port	15	Absorber
7	Inspiratory valve	16	Pressure sensor connector
8	Breathing bag terminal	17	Sample-gas return line port (optional)

6.1.1 Function Description of the Compact Breathing System "Cosy"

Manual Ventilation: General

During manual ventilation, the APL valve is set to the "MAN" position. The patient system safety valve is activated. Only the warnings/alarms for the lower O_2 limit and for the upper airway pressure (Paw) are enabled. The piston of the ventilator is in the upper end position in order to reduce the dead space volume of the ventilator.

Manual Ventilation: Inspiration

During inspiration, expiratory valve **1** remains closed. When the clinician compresses the breathing bag **2** the gas mixture (expiratory gas and fresh gas) flows through the fresh-gas decoupling valve **3**, the inspiratory valve **4**, the O_2 sensor **5**, the inspiratory hose **6**, and the Y-piece into the patient's lung **7**. The pressure sensor **8** measures the airway pressure. The APL valve **9** limits the ventilation pressure. Any excess amount of the gas mixture flows through the APL valve **9** and the non-return valve **10** to the anesthetic gas scavenging system.

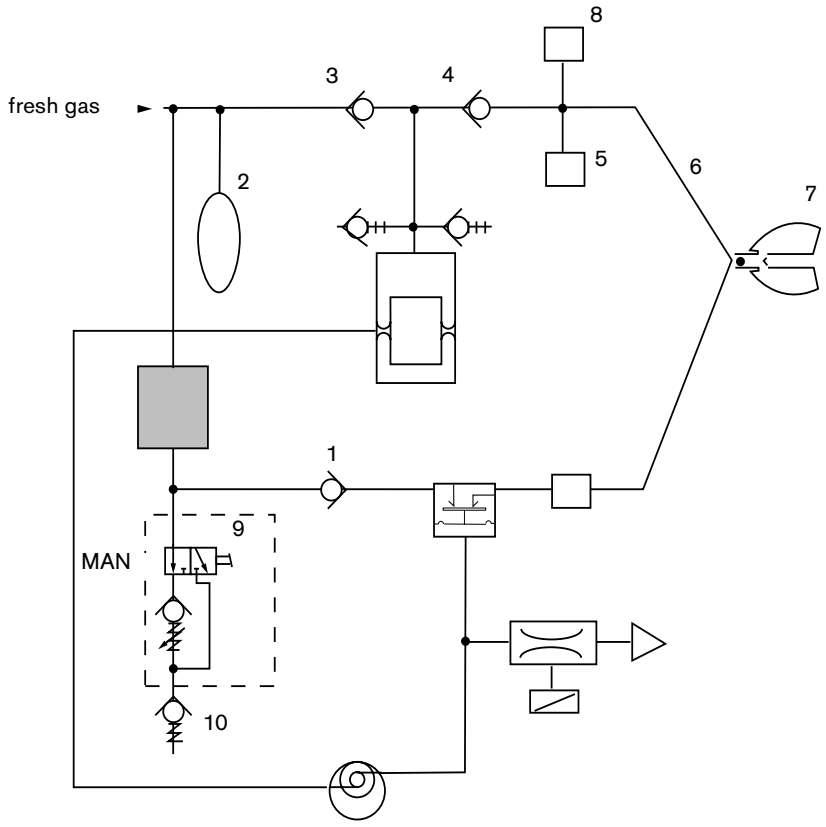


Fig. 13: Manual ventilation (inspiration)

Manual Ventilation: Expiration

During expiration, the inspiratory valve **1** remains closed and thus prevents the expiratory gas from flowing back into the inspiratory branch.

After releasing the breathing bag **2**, the expiratory gas from the lung **3** flows through the expiratory hose **4**, the flow sensor **5**, the PEEP control valve **6**, the expiratory valve **7,** and through the absorber **8** into the breathing bag **2**. At the same time, new fresh gas flows into the breathing bag **2**.

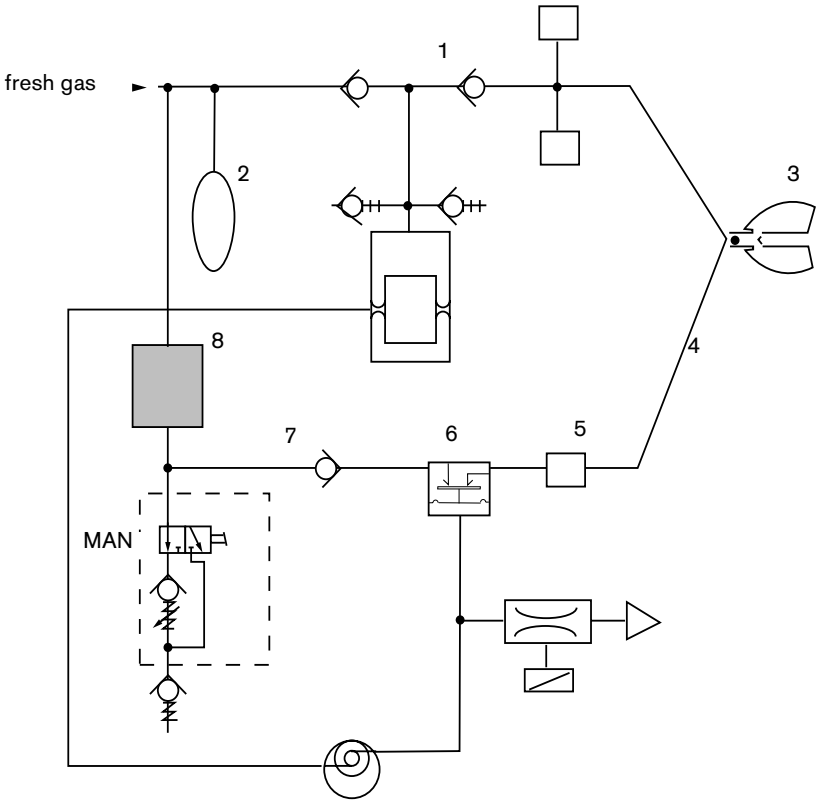


Fig. 14: Manual ventilation (expiration)

Spontaneous Breathing: General

A prerequisite for spontaneous breathing is that the patient is supplied with a sufficient amount of fresh gas. The APL valve selector must be set to the "SPONT/IPPV" position. No pressure builds up in the compact breathing system. Only the warnings/alarms for the lower O_2 limit and for the upper airway pressure (Paw) are enabled.

Spontaneous Breathing: Inspiration

During inspiration, the expiratory valve **1** remains closed thus preventing rebreathing of expiratory gas containing CO_2.

The patient inhales the gas mixture (expiratory gas and fresh gas) from the breathing bag **2**. The gas mixture flows through the fresh-gas decoupling valve **3**, the inspiratory valve **4**, the O_2 sensor **5**, the inspiratory hose **6**, and through the Y-piece into the lung **7**. The pressure sensor **8** measures the airway pressure.

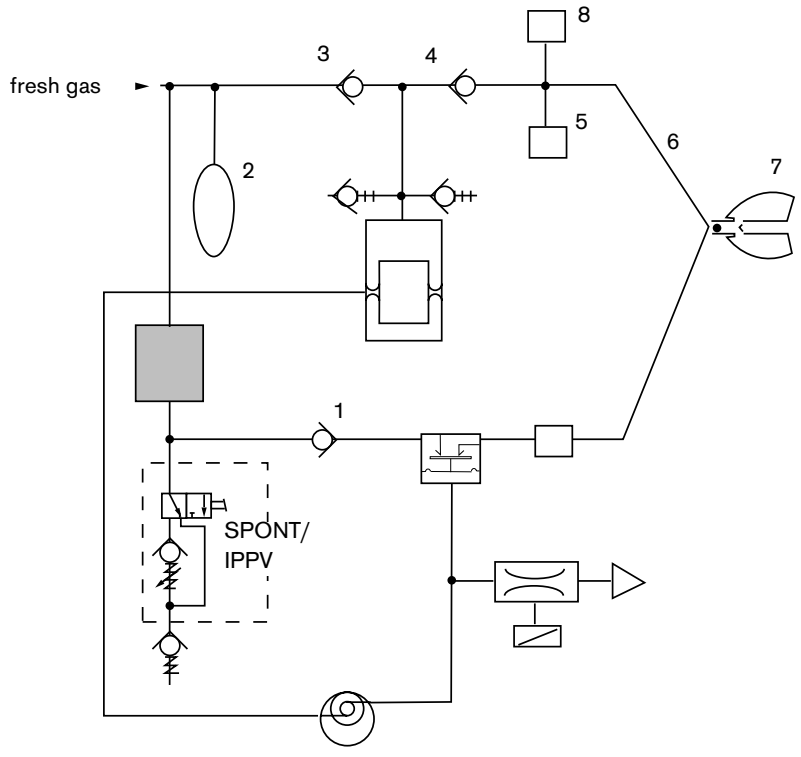


Fig. 15: Spontaneous breathing (inspiration)

Spontaneous Breathing: Expiration

During expiration, the inspiratory valve **1** remains closed thus preventing the expiratory gas from flowing back into the inspiratory branch.

The APL valve **2** is open, irrespective of its pressure setting.

The expiratory gas flows from the lung **3** through the expiratory hose **4**, the flow sensor **5**, the PEEP control valve **6**, the expiratory valve **7**, and through the absorber **8** into the breathing bag **9**. At the same time, new fresh gas flows into the breathing bag.

When the breathing bag is full, any excess gas mixture flows through the non-return valve **10** into the anesthetic gas scavenging system.

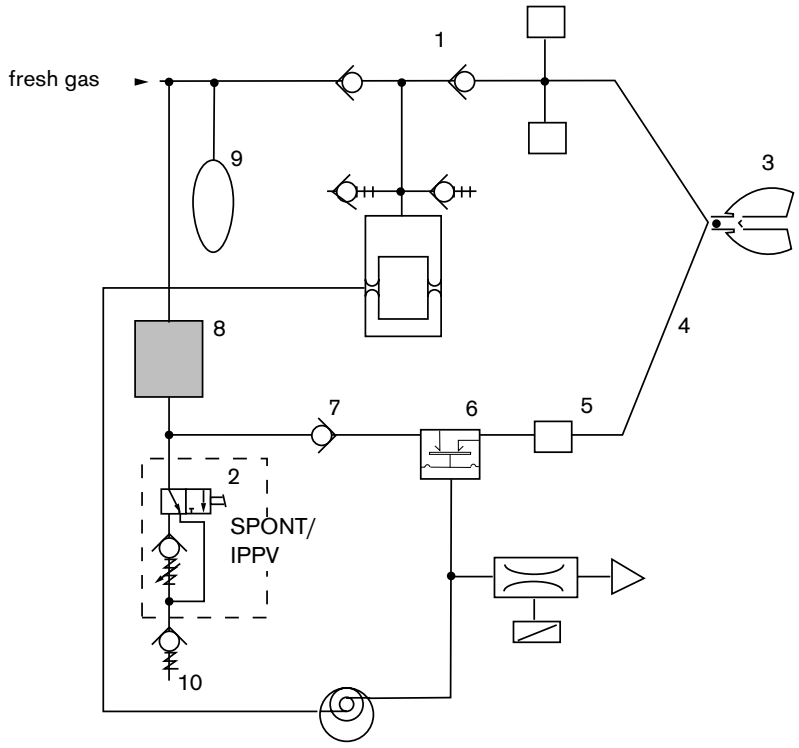


Fig. 16: Spontaneous breathing (expiration)

The CO_2 is scrubbed from the expiratory gas by the soda lime contained in the absorber **8**. The fresh gas replaces the anesthetic and oxygen taken up by the patient.

Intermittent Positive Pressure Ventilation (IPPV): General

A prerequisite for IPPV is that the patient is supplied with a sufficient amount of fresh gas. The APL valve selector must be set to the "SPONT/IPPV" position.

If the APL valve selector is not set to the "SPONT/IPPV" position, the pressure in the breathing system will increase.

The safety valve of the patient system makes sure that no pressures greater than 80 hPa (mbar) build up in the system. The pressure limit (Pmax) can be adjusted on the control box.

Intermittent Positive Pressure Ventilation (IPPV): Inspiration

During inspiration, the PEEP control valve **1** remains closed. The control pressure present at the PEEP control valve **1** varies with the set pressure limit (Pmax).

The pressure generated by the ventilator's piston closes the fresh-gas decoupling valve **2**. The gas mixture (expiratory gas and fresh gas) flows through the inspiratory valve **3**, the O_2 sensor **4**, the inspiratory hose **5**, and through the Y-piece into the lung **6**. The pressure sensor **7** measures the airway pressure. The ventilation pressure cannot exceed the pressure limit (Pmax) set on the control box because the PEEP control valve **1** opens. The fresh gas then fills the breathing bag **8**.

Any excess fresh gas flows through the open APL valve **9**, and through the non-return valve **10** into the anesthetic gas scavenging system.

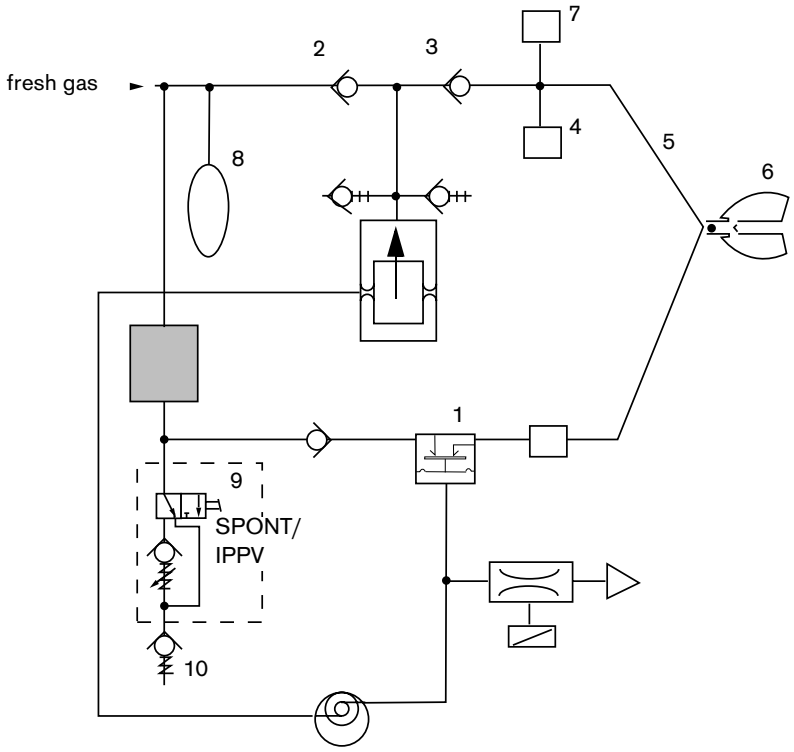


Fig. 17: Intermittent positive pressure ventilation (inspiration)

Intermittent Positive Pressure Ventilation (IPPV): Expiration

During expiration, the inspiratory valve **1** remains closed thus preventing rebreathing into the inspiratory branch.

The expiratory gas from the lung **2** flows through the expiratory hose **3**, the flow sensor **4**, the PEEP control valve **5**, the expiratory valve **6**, and through the absorber **7** back into the breathing bag **8** mixing with fresh gas also flowing into the breathing bag.

The ventilator's piston moves back drawing the gas mixture needed for the next inspiration into the piston space.

Any excess fresh-gas flows through the APL valve **9**, and through the non-return valve **10** into the anesthetic gas scavenging system.

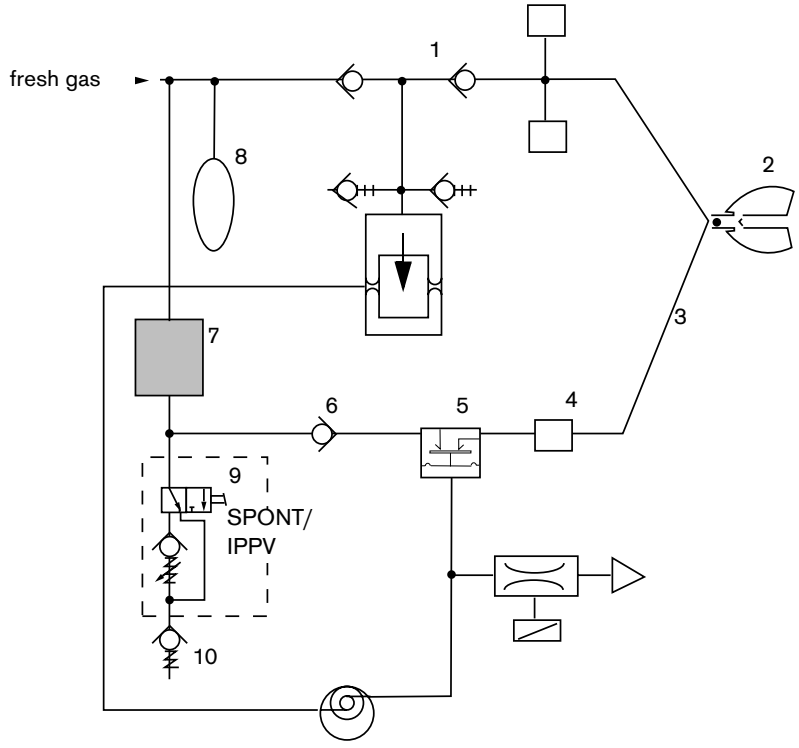


Fig. 18: Intermittent positive pressure ventilation (expiration)

6.1.2 Cosy Absorber

The absorber is filled with humidified soda lime. The soda lime scrubs CO_2 from the respiratory gas and, because it is humidified, it prevents any absorption of anesthetics.

Spent soda lime changes its color. The soda lime must be replaced when two thirds of the soda lime in a canister are discolored.

6.2 Circle Absorption System "Circle System 9 Fabius"

The circle absorption system "Circle System 9 Fabius" allows three modes of patient ventilation: manual ventilation, spontaneous breathing, intermittent positive pressure ventilation (IPPV). The APL valve (adjustable pressure limiting valve) has a selector which can be used to toggle between "MAN" and "IPPV/SPONT".

In the "MAN" position, the compact breathing system is closed to atmosphere. This position is the default position for manual ventilation of the patient. The APL valve opening pressure can be adjusted from 5 to 70 hPa (mbar).

In the "IPPV/SPONT" position the APL valve is open to atmosphere. This position is the default position for intermittent positive pressure ventilation and spontaneous breathing.

The pressure limit (Pmax) can also be adjusted during IPPV from 20 hPa (mbar) to 70 hPa (mbar) using the control box.

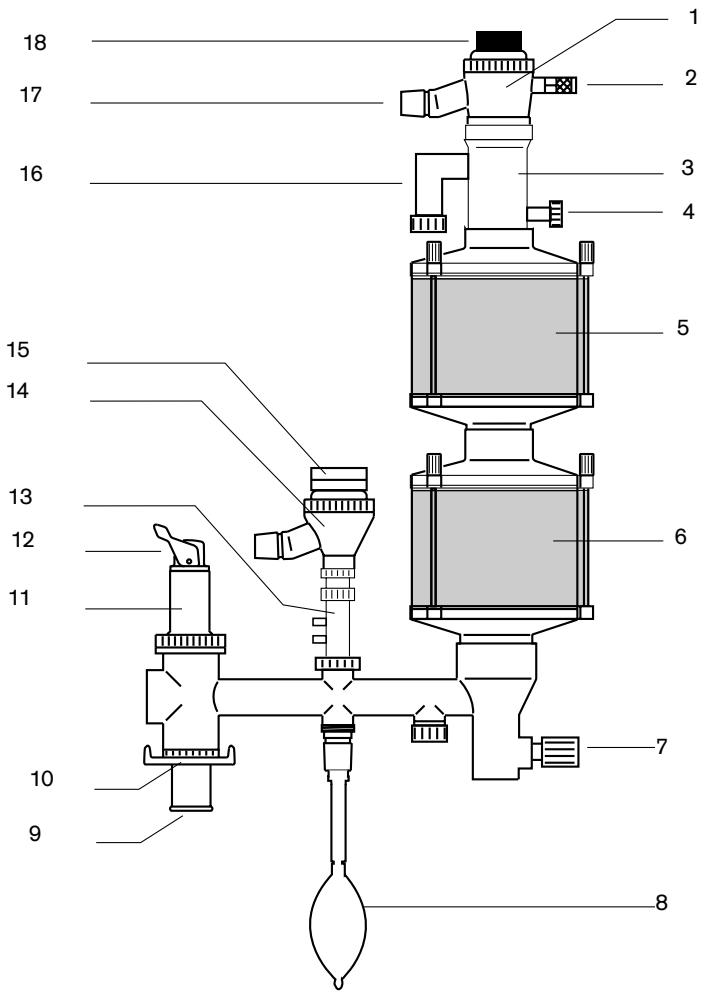


Fig. 19: Circle absorption system "Circle System 9 Fabius"

Key

1	Inspiratory valve	10	Non-return valve
2	Pressure-measuring port (Paw)	11	APL valve
3	Fresh-gas decoupling valve	12	MAN/SPONT-IPPV selector
4	Fresh-gas port	13	Flow sensor
5	First absorber	14	Expiratory valve
6	Second absorber (optional)	15	PEEP valve
7	Clamping screw	16	Ventilator port
8	Breathing bag	17	Inspiratory port
9	Anesthetic gas scavenging port	18	O_2 sensor

6.2.1 Function Description of the Circle Absorption System

Manual Ventilation: General

During manual ventilation, the APL valve is set to the "MAN" position. The safety valve of the patient system is activated. Only the warnings/alarms for the lower O_2 limit and the upper airway pressure limit (Paw) are enabled.

Manual Ventilation: Inspiration

When the clinician compresses the breathing bag **1**, the gas mixture (expiratory and fresh gas) flows through the absorber **2**, the open fresh-gas decoupling valve **3**, the open inspiratory valve **4**, the inspiratory hose **5**, and through the Y-piece **6** into the lung **7**. The CO_2 contained in the gas mixture is scrubbed by the soda lime in the absorbers **2**. The ventilation pressure is limited by the APL valve **8**. The expiratory valve **9** remains closed. Any excess amount of the gas mixture flows through the APL valve **8**, and the non-return valve **10** into the anesthetic gas scavenging system **11**.

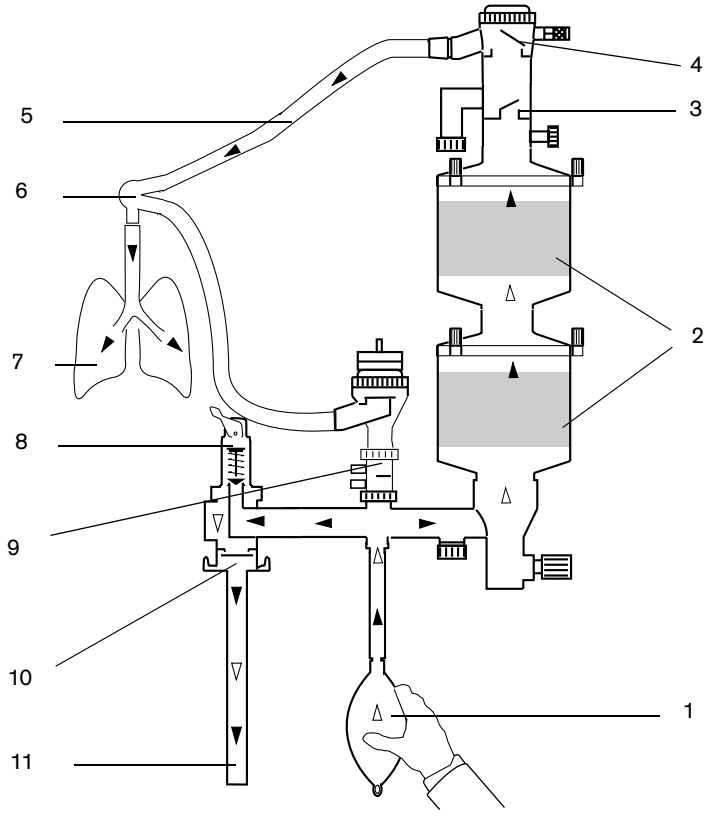


Fig. 20: Manual ventilation (inspiration)

Manual Ventilation: Expiration

During expiration, the inspiratory valve **1** remains closed thus preventing the expiratory gas from flowing back into the inspiratory branch.

After releasing the breathing bag **2**, the expiratory gas flows through the open expiratory valve **3** and the flow sensor **4** into the breathing bag **2**. At the same time, fresh gas from the fresh-gas port **5** flows through the absorber(s) into the breathing bag **2**.

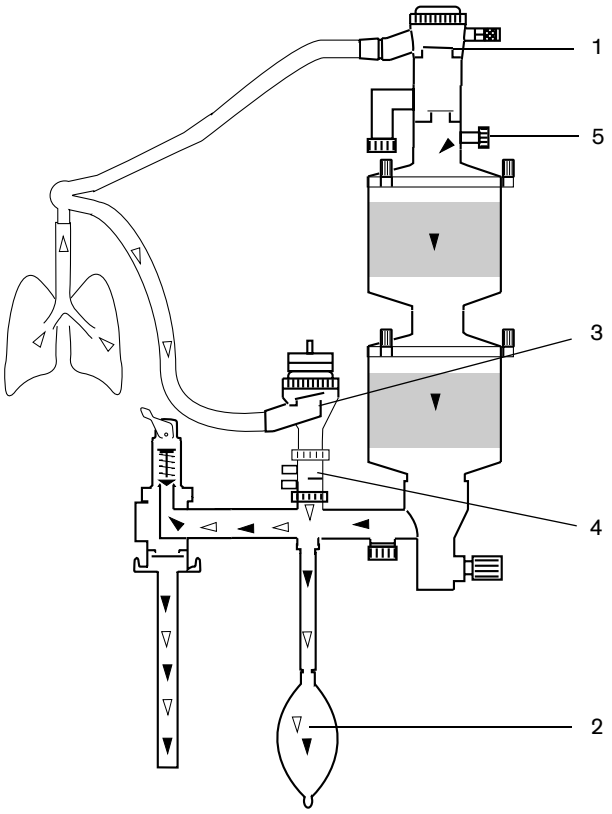


Fig. 21: Manual ventilation (expiration)

Spontaneous Breathing: General

A prerequisite for spontaneous breathing is that the patient is supplied with a sufficient amount of fresh gas. The APL valve selector must be set to the "IPPV/SPONT" position. No pressure builds up in the circle absorption system. Only the warnings/alarms for the lower O_2 limit and the upper airway pressure limit (Paw) are enabled.

Spontaneous Breathing: Inspiration

During inspiration, the expiratory valve **1** remains closed and prevents rebreathing of expiratory gas containing CO_2.

The patient inhales the gas mixture from the breathing bag **2.** The gas mixture flows through the absorber(s) **3**, the open inspiratory valve **4**, the inspiratory hose **5**, and the Y-piece **6**. Additional fresh gas is supplied to the patient through the fresh-gas port **7**.

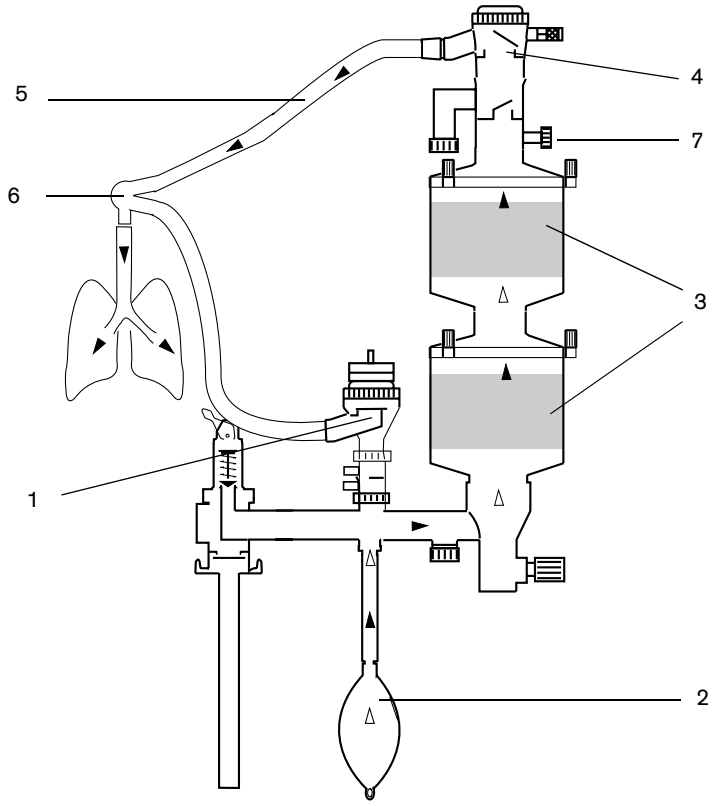


Fig. 22: Spontaneous Breathing (inspiration phase)

The CO_2 is scrubbed from the expiratory gas by the soda lime contained in the absorber(s) **3**. The fresh gas replaces the anesthetic and the oxygen taken up by the patient.

Spontaneous Breathing: Expiration

During expiration, the inspiratory valve **1** remains closed thus preventing the expiratory gas from flowing back into the inspiratory branch.

The APL valve **2** is open, irrespective of the current pressure setting.

The expiratory gas flows through the expiratory hose **3**, the open expiratory valve **4**, the flow sensor **5**, into the breathing bag **6**. At the same time, fresh gas from the fresh-gas port **7** flows through the absorber(s) **8** into the breathing bag **6**.

When the breathing bag **6** is full, any excess gas mixture flows through the non-return valve **9** into the anesthetic gas scavenging system **10**.

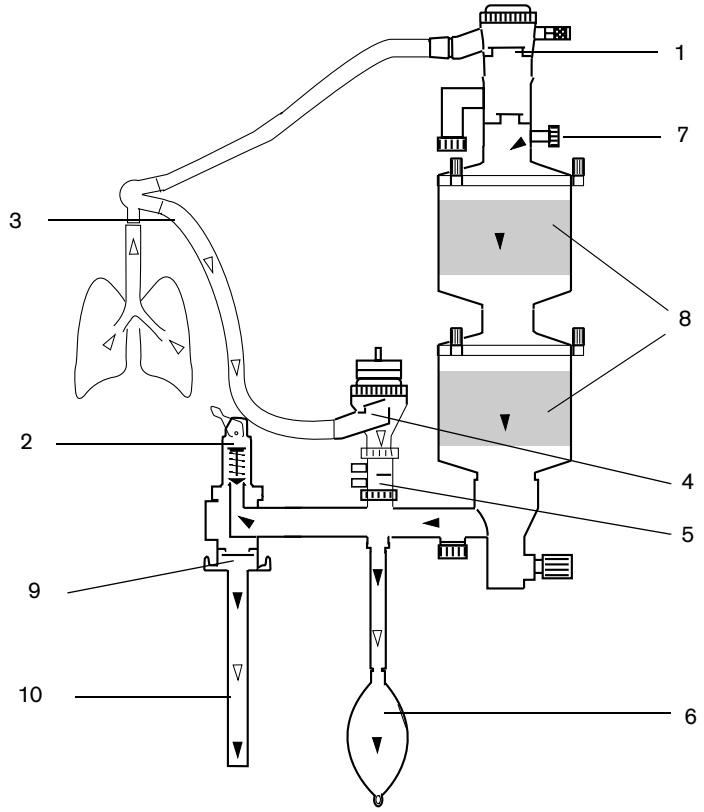


Fig. 23: Spontaneous breathing (expiration)

Intermittent Positive Pressure Ventilation (IPPV): General

A prerequisite for IPPV is that the patient is supplied with a sufficient amount of fresh gas. The APL valve selector must be set to the "IPPV/SPONT" position.

If the APL valve selector is not set to the "IPPV/SPONT" position, the pressure in the breathing system will increase.

The safety valve of the patient system limits the pressure to 80 hPa (mbar). The desired pressure limit (Pmax) can be adjusted on the control box.

Intermittent Positive Pressure Ventilation (IPPV): Inspiration

During inspiration, the inspiratory valve **1** remains open. The PEEP valve closes the expiratory valve **2**. A control pressure, which varies with the pressure limit (Pmax) set on the control box, is applied to the PEEP valve.

The gas mixture (expiratory and fresh gas) from the ventilator **3** flows through the hose **4**, the inspiratory valve **1**, the inspiratory hose **5**, and through the Y-piece **6** into the lung **7**. The ventilation pressure cannot exceed the pressure limit (Pmax) set on the control box. The fresh gas flows through the absorbers and fills the breathing bag.

Any excess amount of fresh gas flows through the APL valve **8** and the non-return valve **9** into the anesthetic gas scavenging system **10**.

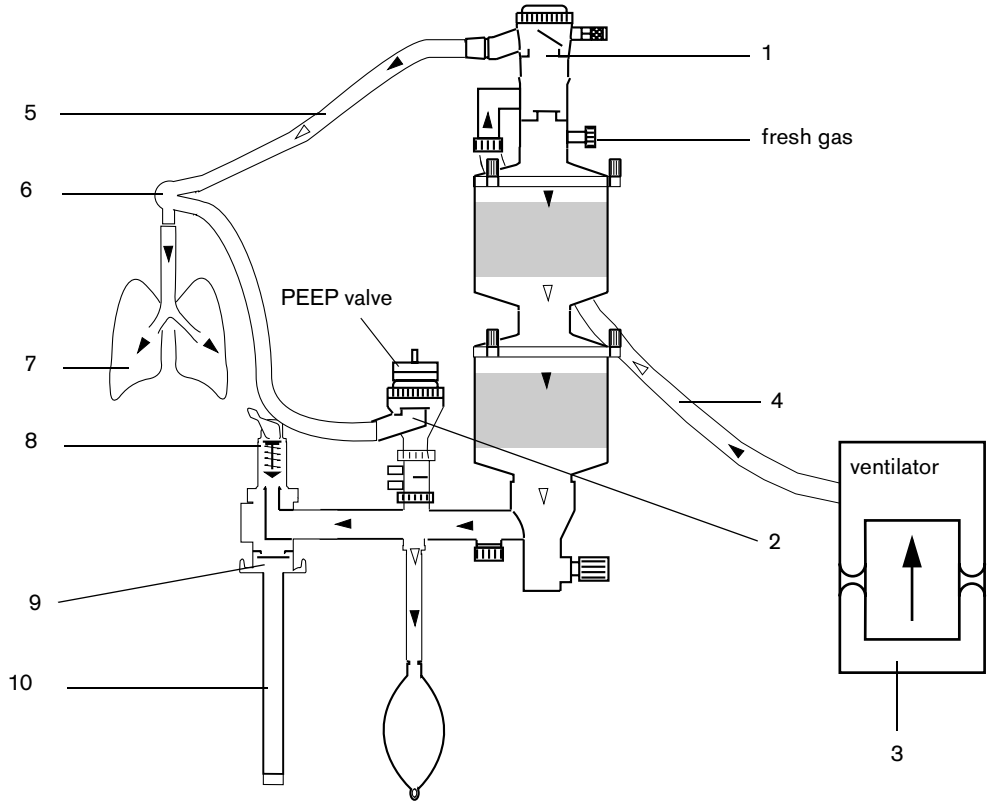


Fig. 24: Intermittent positive pressure ventilation (inspiration)

If the inspiratory pressure exceeds the set pressure limit (Pmax), the PEEP valve opens. Any excess gas flows through the PEEP valve, and the flow sensor into the circle absorption system.

Intermittent Positive Pressure Ventilation: Expiration

During expiration, the inspiratory valve **1** remains closed thus preventing rebreathing into the inspiratory branch.

The expiratory gas flows through the expiratory valve **2**, the flow sensor **3**, back into the breathing bag **4** and, at the same time, mixes with the fresh-gas from the fresh gas port **5**.

The ventilator piston moves back drawing the gas mixture needed for the next inspiration into the piston space.

The excess fresh gas flows through the APL valve **6**, and through the non-return valve **7 in**to the anesthetic gas scavenging system **8**.

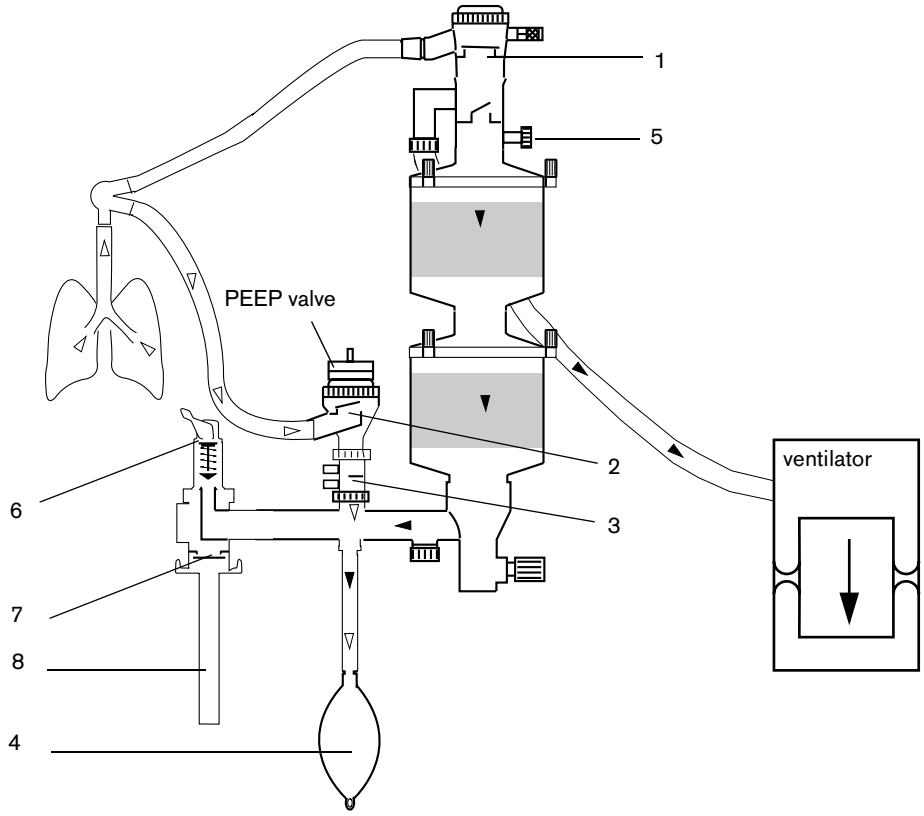


Fig. 25: Intermittent positive pressure ventilation (expiration)

Intermittent Positive Pressure Ventilation: Expiration with PEEP

A PEEP value is adjusted on the control box. The corresponding PEEP control pressure is applied to the diaphragm of the PEEP valve. The diaphragm plate of the PEEP valve pushes the mica disc of the expiratory valve which closes the crater. If the pressure of the expiratory gas exceeds the set PEEP value, the expiratory valve **2** opens.

6.2.2 Absorber

The absorber is filled with humidified soda lime. The soda lime scrubs the CO_2 from the respiratory gas and, because it is humidified, it prevents any absorption of anesthetics.

Spent soda lime changes its color. The soda lime must be replaced when two thirds of the soda lime in a canister are discolored.

7 Ventilation Unit

The ventilation unit consists of the ventilator and the pneumatics.

The ventilation unit is powered with DC voltage from the control box or, in the event of mains power failure, from the uninterruptible power supply (UPS). The ventilator delivers the fresh gas (at a given volume, pressure, and frequency) which comes from the flowmeter block and from the breathing bag to the patient. During expiration, the bag-type rolling seal of the ventilator fills with the expiratory gas from the patient and with the fresh gas stored in the breathing bag.

During inspiration, a specific amount of this gas mixture is delivered to the patient. A safety valve limits the ventilation pressure.

If the fresh gas in the machine is not sufficient, the ventilator draws in ambient air through the auxiliary air valve located in the patient system.

7.1 Ventilator

The ventilator is mounted into the swivel-out compartment of Fabius. The cover of the ventilator has a connection for the respiratory hose of the circle absorption system or compact breathing system, respectively. The ventilator is powered electrically. Its control system and keypad are located in/on the control box. The control box also contains the basic monitoring system. A sight window on the swivel out compartment allows the clinician to watch the movement of the rolling seals.

7.1.1 Function Principle of the Ventilator

The ventilator consists of a piston and a cylinder. The recirculating ball screw driven by the motor moves the piston. When the piston moves back it slides completely over the motor. The incremental encoder determines the number of motor rotations and transmits the corresponding signal to the microprocessor. The rolling seal is attached to the piston. The bag-type rolling seal encloses the inspiratory volume.

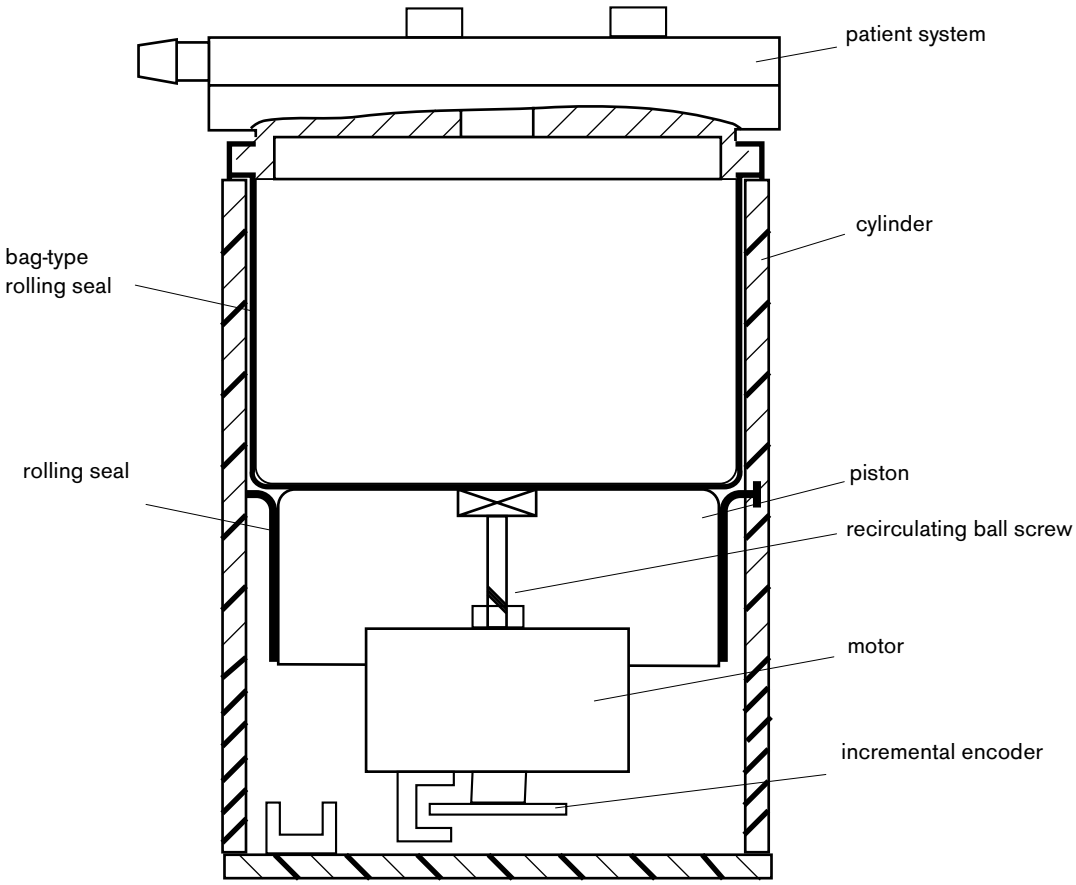


Fig. 26: Sectional view of the ventilator

7.2 Pneumatics

The pneumatics comprises the following subassemblies:

- electronic PEEP valve
- Pneumatic Control PCB
- piston pump
- pressure sensor

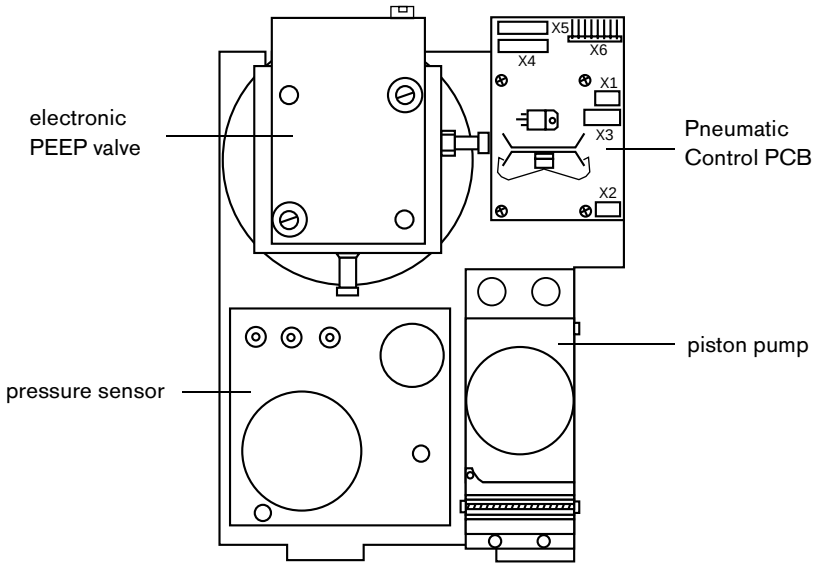


Fig. 27: Top view of the pneumatics

7.2.1 Function Principle of the Pneumatic Control of the Ventilator

The piston pump generates a vacuum required for the bag-type rolling seal and the rolling seal of the ventilator as well as the control pressure for the PEEP valve. The spring-loaded non-return valve limits the vacuum to –200 hPa (mbar). A pressure sensor measures the current pressure and converts the pressure value into a corresponding electrical signal. This signal is transmitted to the microprocessor. The reservoir V1 "smooths" the flow to the electronic PEEP valve. The combination of filter and reservoir V2 dampen the noise.

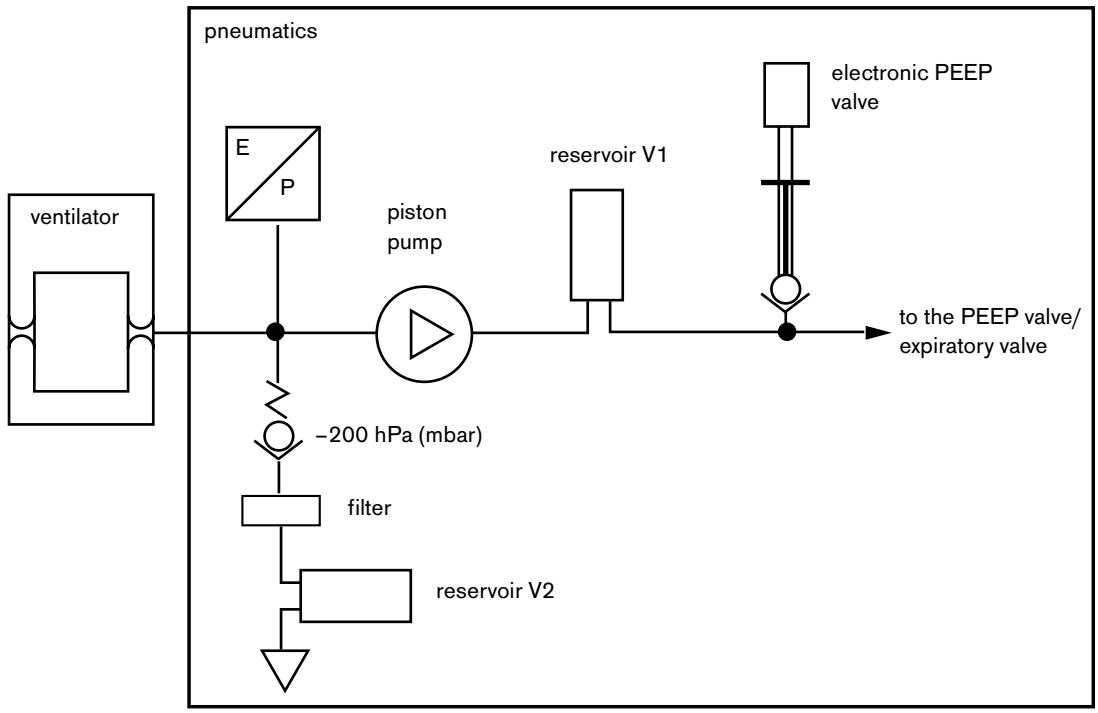


Fig. 28: Function diagram of the pneumatic control of the ventilator

7.3 Function Description of the Electronic PEEP Valve

7.3.1 Expiration

The piston pump generates a gas flow. This gas flow is directed to the electronic PEEP valve.

If an endexpiratory PEEP value has been set on the control box, this value corresponds to a specific electrical current. The current flows across the coil of the electronic PEEP valve. The diaphragm closes the crater. The electronic PEEP valve generates a control pressure. This control pressure is applied to the mechanical PEEP valve. The patient can only exhale up to the set PEEP value.

7.3.2 Inspiration

During inspiration, the electronic PEEP valve generates a control pressure which corresponds to the set pressure limit (Pmax).

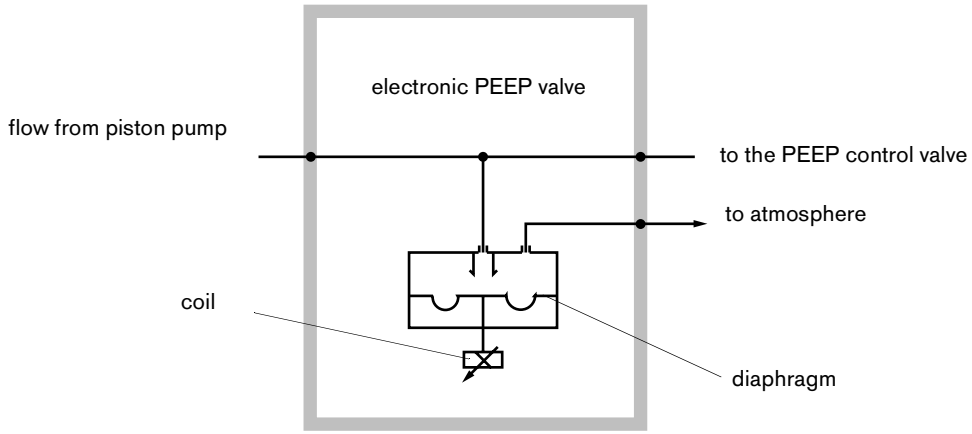


Fig. 29: Function diagram of the electronic PEEP valve

8 Patient System

The patient system provides the connection between Fabius and the patient.

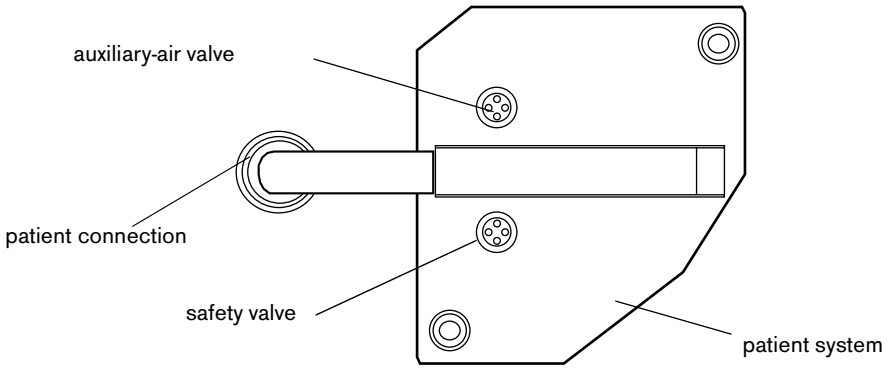


Fig. 30: Top view of the patient system

8.1 Safety Valve of the Patient System

If the pressure limit (Pmax) is exceeded considerably, or if the pressure limit control fails, the patient system safety valve limits the gas pressure. This safety valve is permanently set to a working pressure of 60 hPa (mbar) to 80 hPa (mbar).

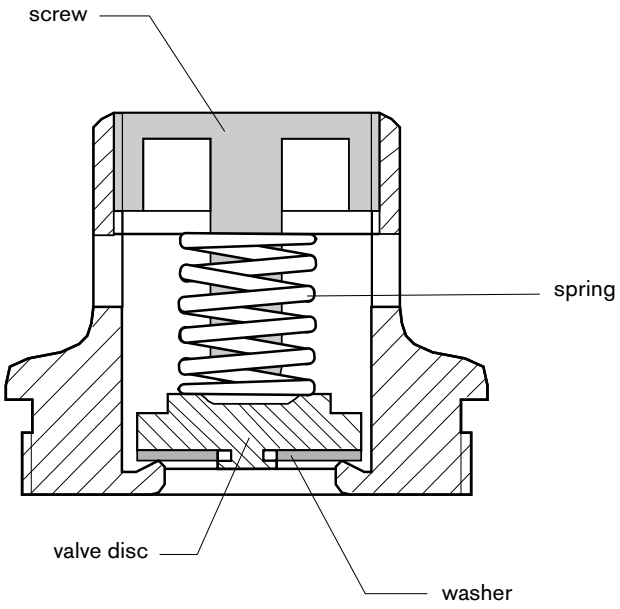


Fig. 31: Sectional view of the safety valve

8.2 Auxiliary Air Valve of the Patient System

The auxiliary air valve allows the patient to spontaneously breathe ambient air should the medical gas supply and/or Fabius fail. The opening pressure of the auxiliary air valve is 0 to –5 hPa (mbar).

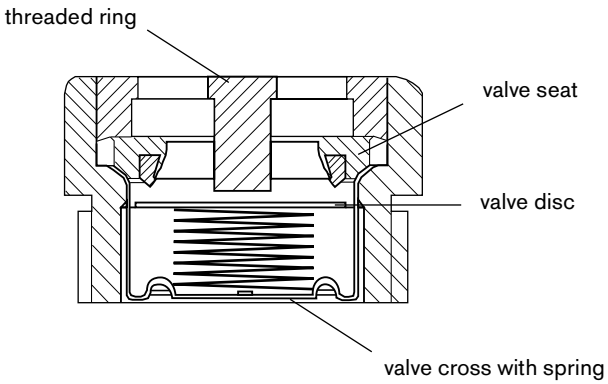


Fig. 32: Sectional view of the auxiliary air valve

9 Electronics Block Diagram

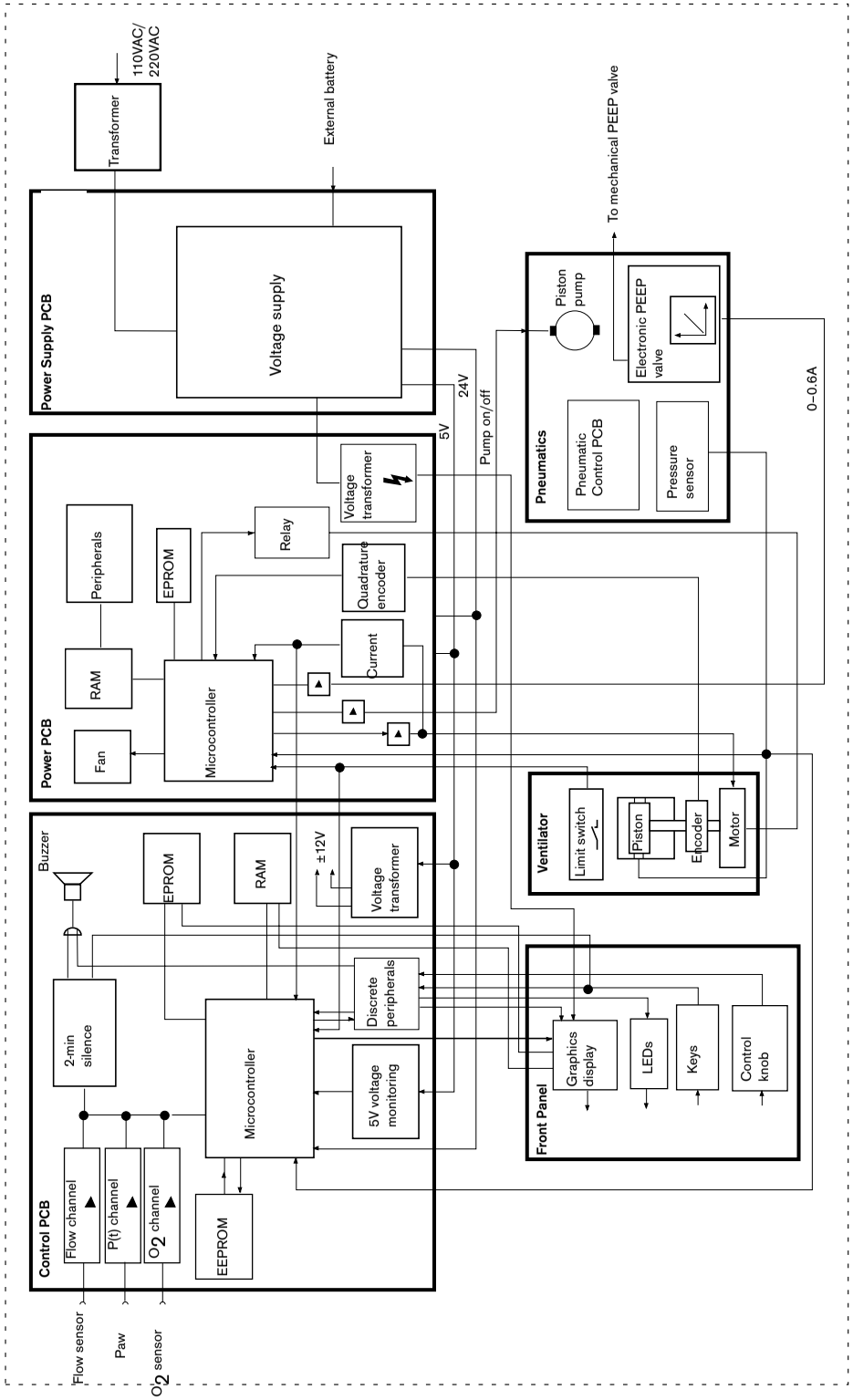


Fig. 33: Electronics block diagram

10 Control Box

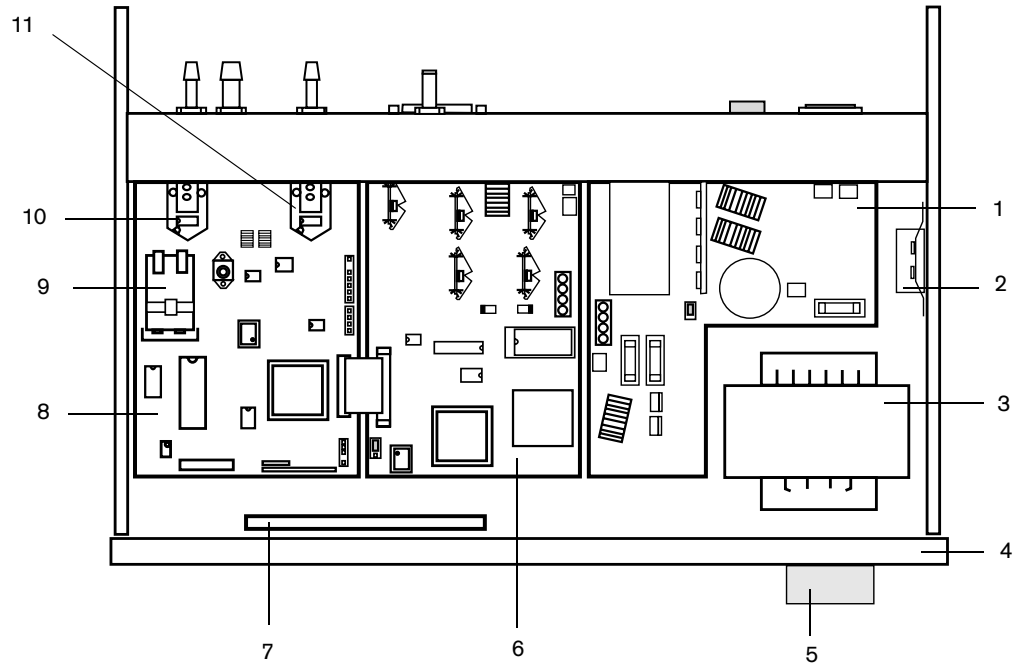


Fig. 34: Top view of the control box

Key

1	Power Supply PCB
2	Mains filter
3	Mains transformer
4	Front panel (front frame and membrane keypad)
5	Control knob
6	Power PCB
7	Graphics display and backlighting lamp
8	Control PCB
9	Rechargeable battery
10	Differential pressure sensor (flow)
11	Airway pressure sensor (Paw)

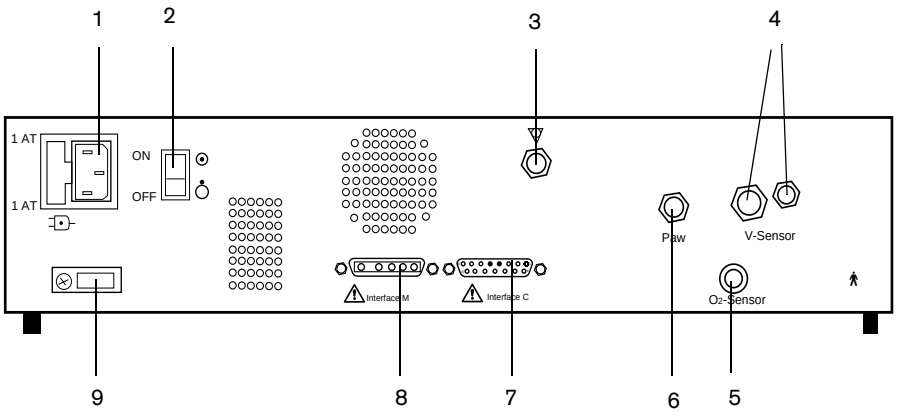


Fig. 35: Rear View of the Control Box

Key

1 Mains supply receptacle with mains fuses

2 ON/OFF switch

3 Equipotential bonding pin

4 Flow sensor port

5 O_2 sensor port

6 Pressure sensor port (Paw)

7 Motor connector

8 Pneumatics connector

9 Power cord clamp

10.1 Power Supply Unit

The power supply unit consists of the Power Supply PCB, the mains supply receptacle, the ON/OFF switch, the fuses, the mains filter, and the mains transformer.

The power supply unit powers Fabius with the following voltages:

- +24 VDC
- +5 VDC

10.1.1 Power Supply PCB

The Power Supply PCB uses the voltage regulator L4960 to generate the +5 V operating voltage.

Two voltage regulators LT1074 connected in parallel generate the supply voltage (28 V) and the rechargeable battery charging voltage.

The resistor S1 (the conductor is designed as sense resistor) is used to measure the charging current of the rechargeable battery. An integrated circuit transmits the signal to the microcontroller.

The signals A and B are fed back to the 24 V voltage regulators and function as charging current limitation.

The Power Supply PCB monitors the rechargeable battery voltage, generates the battery symbol control on the display and the power failure alarm.

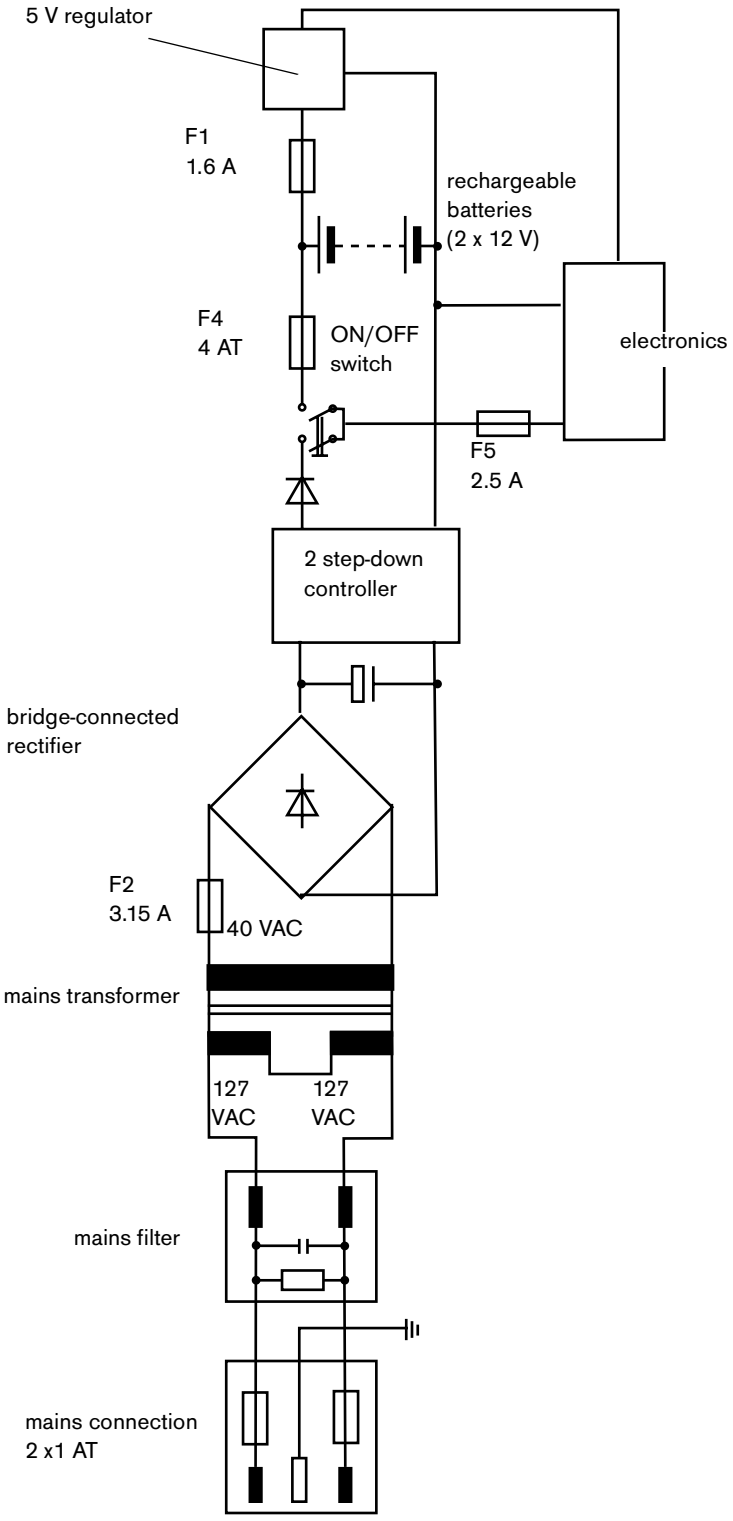


Fig. 36: Block diagram of the control box power supply unit

10.2 Control PCB

The Control PCB measures and monitors all measuring and status signals. If an error occurs, the Control PCB switches off the valves, and activates the buzzer. The Control PCB is then reset.

The Control PCB is equipped with the pressure sensors for the airway pressure (Paw) and the flow (ΔP).

The Control PCB comprises the following components:

- microcontroller
- quartz oscillator
- EPROM
- EEPROM
- RAM
- latch
- 9 V rechargeable battery

The Control PCB provides the following functions:

- measurement of oxygen concentration, flow, and pressure
- voltage monitoring and power-on
- LED control
- 2-min silence timer
- buzzer and buzzer control
- contrast control
- membrane keypad scanning
- control knob scanning
- motor current monitoring
- membrane pressure
- charging voltage monitoring
- display control
- ±12 V generation

10.3 Control PCB Block Diagram

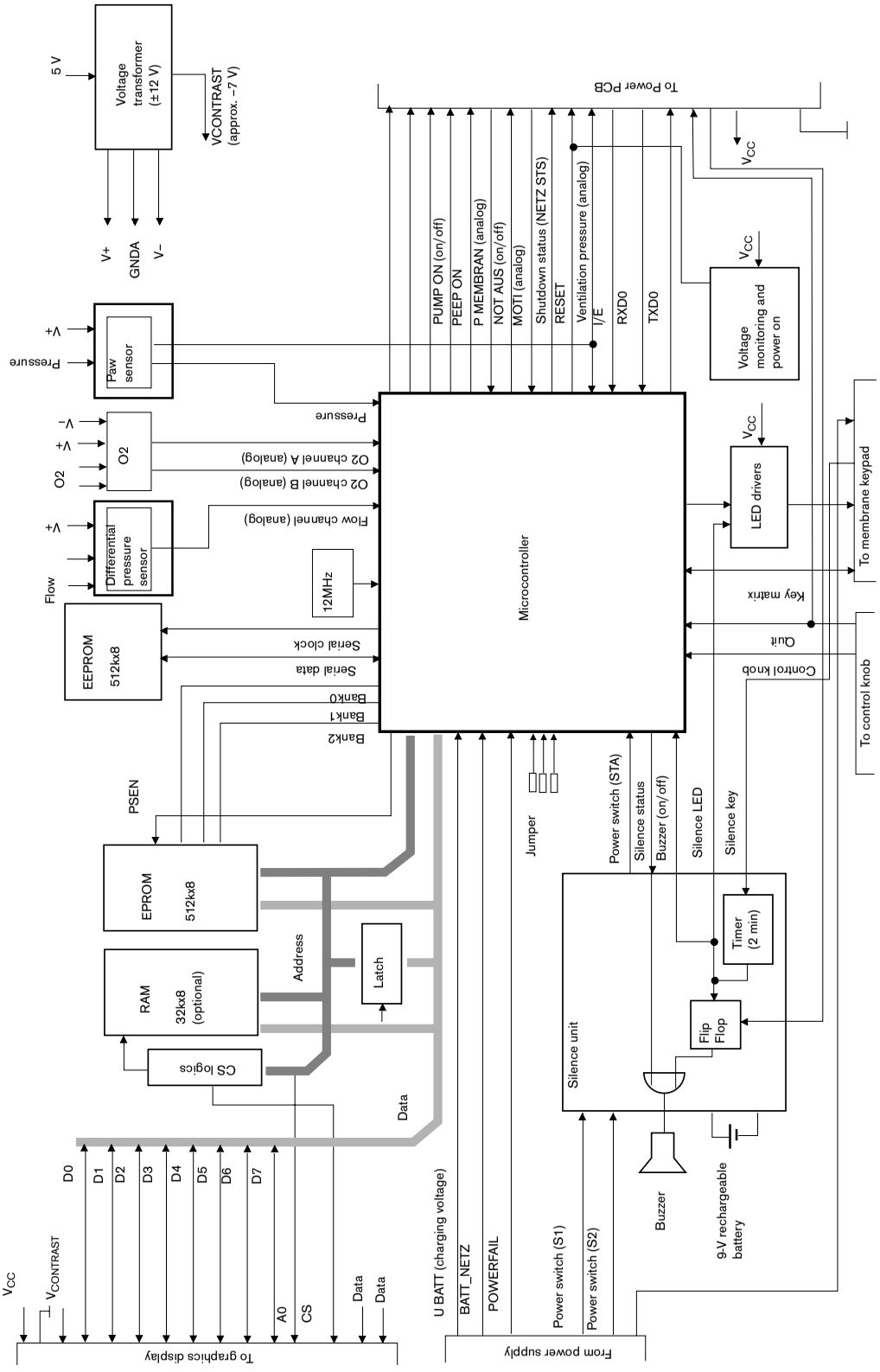


Fig. 37: Control PCB block diagram

10.3.1 Microcontroller

The microcontroller 80C517A controls the functions of the control box.

10.3.2 Quartz Oscillator

The quartz oscillator QOS12Mhz clocks the microcontroller 80C517A with 12 MHz.

10.3.3 EPROM

The EPROM M27C4001 is used to store the program for the control box. It has a programmable area of 512 kbytes.

10.3.4 EEPROM

The EEPROM X24C04 is a memory chip used to write and read serial data. It contains the set customer parameters and the zero values of flow, pressure, and O_2.

10.3.5 RAM

The 32 Kx8 RAM contains the current patient parameters and stores data which the microcontroller needs to buffer.

10.3.6 Latch

Latch HC373 is a driver block.

10.3.7 Voltage Transformer

The voltage transformer transforms the 5 V input voltage into the ±12 V output voltage.

10.3.8 Oxygen Concentration Evaluation

The operational amplifier OP07 evaluates the voltage of the O_2 sensor.

10.3.9 Voltage Monitoring Circuit/Voltage Monitor

The IC 7665 monitors the output voltage (+5 V) of the control box. If the voltage is higher or lower than the specified voltage, the IC 7665 generates a RESET signal. This RESET signal resets the microcontroller. The IC makes sure that the microcontroller only initializes when the operating voltage has reached an adequate level.

10.3.10 LED Control

The LEDs (LED_MAN, LED_IPV, LED_SBY, LED_SIL, LED_WAR and LED_ALA) are triggered by the transistors BCX17.

10.3.11 2-Min Silence Timer

The 2-min silence timer has a timer IC (74HC4060). The timer IC enables suppression of the audible alarm for two minutes.

10.3.12 Buzzer and Buzzer Control

During operation, the buzzer is powered with 24 V. If a power failure occurs, the built-in 9 V rechargeable battery on the Control PCB powers the buzzer. In the event of a failure, the buzzer is triggered by the microcontroller.

10.3.13 Contrast Control

The operational amplifier TL072D generates the contrast voltage for the graphics display. The contrast voltage is approximately –7 VDC to –8 VDC.

10.3.14 9V Rechargeable Battery

In the event of a power failure, the 9 V rechargeable battery supplies the operating voltage for the buzzer. The 24 V operating voltage supplies a charging circuit which charges the rechargeable battery during normal operation.

10.4 Power PCB

The Power PCB controls the piston pump, the electronic PEEP valve, the fan, the ventilator motor, and the backlighting of the graphics display.

The Power PCB comprises the following components:

- microcontroller
- quartz oscillator
- EPROM
- latch
- MOSFET amplifier for the motor
- voltage transformer for the backlighting lamp
- PEEP valve control
- light barrier evaluation of the motor (limit switch)
- system temperature monitoring and fan control
- quadrature encoder
- safety relay

10.5 Power PCB Block Diagram

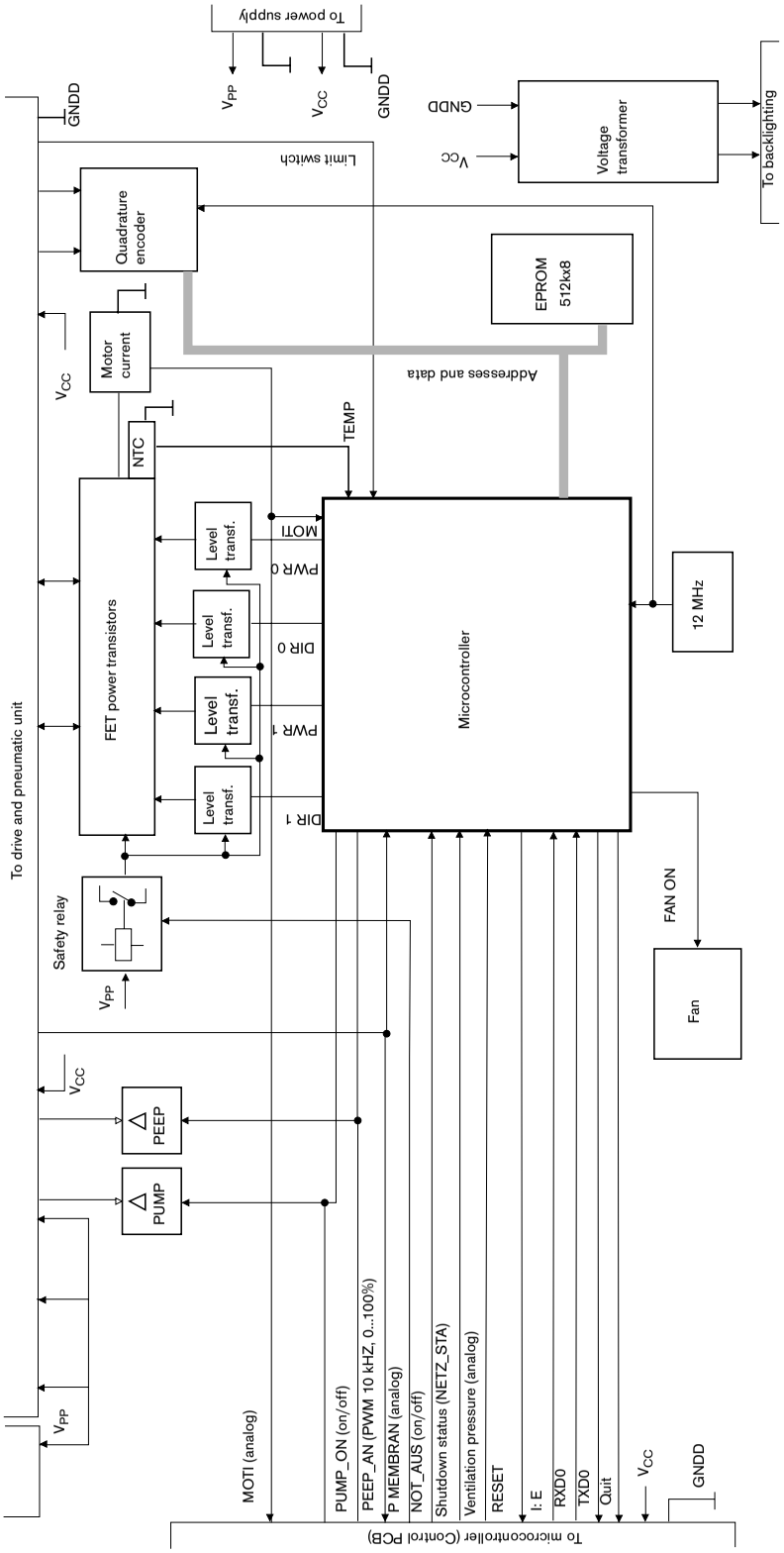


Fig. 38: Power PCB block diagram

10.5.1 Microcontroller

The microcontroller 80C517A controls the functions of the Power PCB.

10.5.2 Quartz Oscillator

The quartz oscillator of the Control PCB clocks the microcontroller 80C517A with 12 MHz.

10.5.3 EPROM

The EPROM has a programmable area of 512 kbytes.

10.5.4 Latch

The latch HC373 is a driver block.

10.5.5 MOSFET Amplifier

The MOSFET amplifier controls the motor of the ventilator.

10.5.6 Voltage Transformer for the Backlighting Lamp

The voltage transformer E1241 transforms the input voltage into a corresponding output voltage for the lamp of the backlighting.

Risk of damage to the voltage transformer.

The voltage transformer will be damaged if used at no load. **Do not operate the voltage transformer without the lamp of the backlighting**.

10.5.7 PEEP Valve Control

The power field-effect transistor BUZ20 and the operational amplifier LM324 control the PEEP valve.

10.5.8 Light Barrier Evaluation of the Motor

The IC 74HC14 evaluates the final position and the movement of the motor (END-SCH, PHASE0, and PHASE1).

10.5.9 System Temperature Monitoring

The system temperature sensor is located on the MOSFET output module. It is an NTC (negative temperature coefficient) thermistor. The microcontroller uses the system temperature sensor to measure the system temperature.

10.5.10 Quadrature Encoder

The quadrature encoder CF32007NT picks up the number of rotations of the motor and transmits this data to the microcontroller.

10.5.11 Safety Relay

In the event of a malfunction, the microcontroller switches off the safety relay using the NOT_AUS (emergency off) signal. As a result, the motor, the electronic PEEP valve, the piston pump, and the fan can no longer be activated.

10.5.12 Fan Control

If the system temperature inside the control box increases (to approx. 60 °C), the microcontroller activates the fan.

10.6 Graphics Display

The graphics display consists of the LCD, the LCD drivers, the LCD controller, the display RAM (8 kbytes), and the fluorescent display (backlighting.

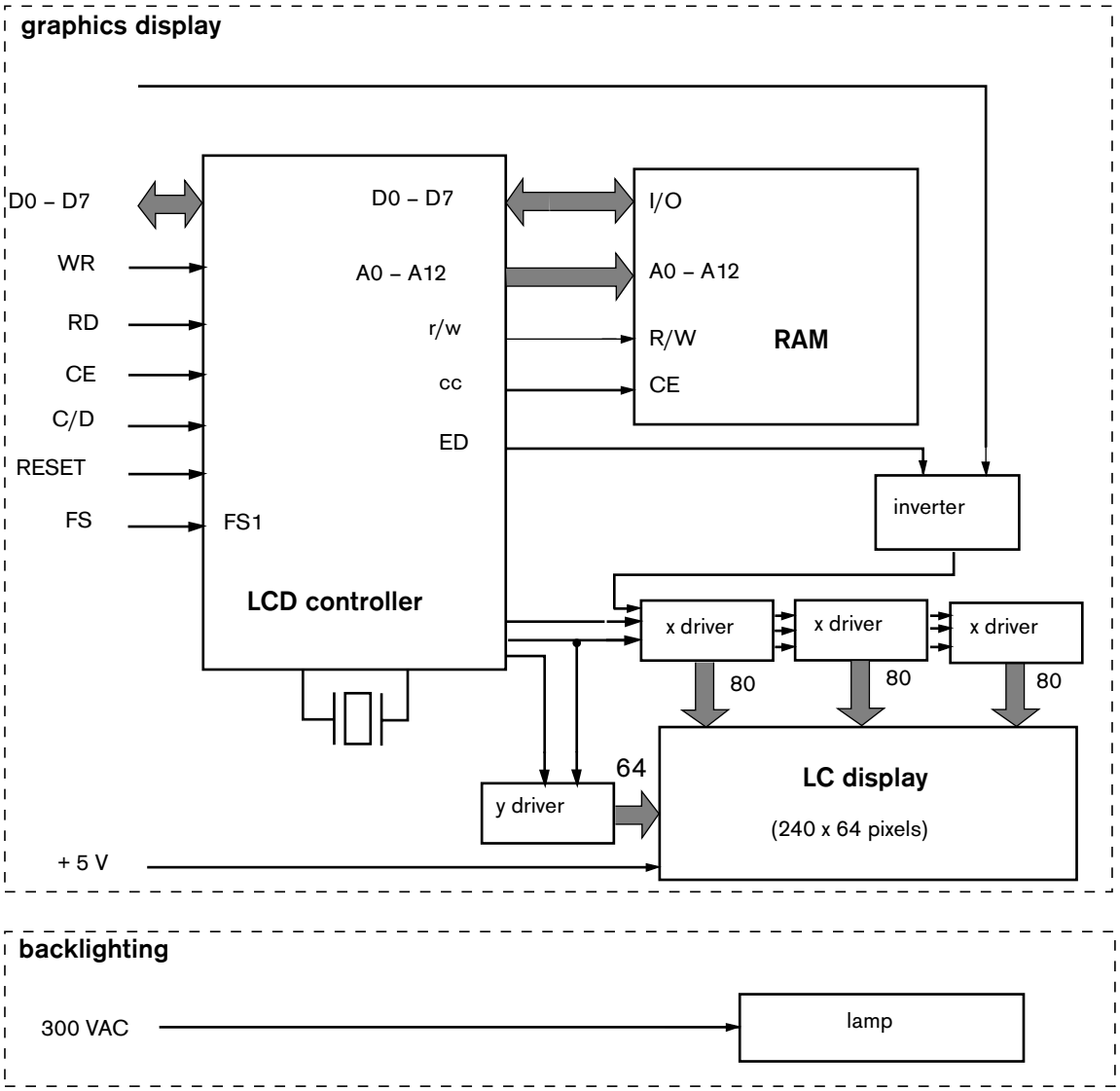


Fig. 39: Block diagram of the graphics display

10.7 Front Panel

The front panel consists of the front frame and the membrane keypad.

10.7.1 Membrane Keypad

The membrane keypad has 15 keys (man/spont, IPPV, Pmax, VT, f_{IPPV}, T_I:T_E, T_{IP}:T_I, PEEP, upper and lower limit value setting, flow calibration, silence, standby, and 3 softkeys). The Control PCB scans the key operations.

10.7.2 Man/Spont Key

Fabius can be set to manual ventilation or spontaneous breathing by pressing the Man/Spont key.

10.7.3 IPPV Key

Fabius can be set to intermittent positive pressure ventilation by pressing the IPPV key.

10.7.4 Pmax Key

The inspiratory pressure limit can be set in a range of 10 hPa (mbar) to 70 hPa (mbar) by pressing the Pmax key. A pressure higher than 40 hPa (mbar) must be confirmed by pressing the Reset/Check key (a message is shown on the display).

10.7.5 V_T Key

After pressing the V_T key, the tidal volume can be set in a range of 50 mL to 1400 mL.

10.7.6 T_I:T_E Key

After pressing the T_I:T_E key, the inspiratory/expiratory time ratio can be set in a range of 1:3 to 2:1. The set value becomes effective at the end of the current respiratory cycle.

10.7.7 T_{IP}:T_I Key

After pressing the T_{ip}:T_i key, the inspiratory pause time to inspiratory time can be set in a range of 5% to 50%. The set value becomes effective at the end of the current respiratory cycle.

10.7.8 PEEP Key

After pressing the PEEP key, the positive end-expiratory pressure may be set in a range of 1 hPa (mbar) to 15 hPa (mbar). The set value has immediate effect.

10.7.9 Limit Values Key

The limit values key is used to set the upper and the lower limit values within a certain range.

10.7.10 Calibration Key (–0–)

After pressing the calibration key (–0–), the differential pressure sensor and the O_2 sensor are calibrated. The O_2 sensor is calibrated to 21 vol.% or 100 vol.%.

10.7.11 2-Min Silence Key

After pressing the 2-min silence key, the audible alarm is silenced for 2 minutes. This status is indicated by the yellow LED in the silence key. Pressing the silence key again during the alarm silence time will reset the audible alarm.

10.7.12 Standby Key

After pressing the standby key, the control box switches over to standby mode.

10.7.13 Menu Key

After pressing the menu key, it is possible to configure Fabius.

10.7.14 Screen Page Key

After pressing the screen page key, it possible to select different screen pages.

10.7.15 Control Knob

The control knob is used to change patient parameters (for example, PEEP, V_T, or P_{max}) by turning (selection of data) and pressing (confirmation of selected data).

10.8 Interface

The interface is use to transmit the analog voltages to the pneumatics.

11 FiO_2 Measurement

The O_2 sensor measures the fraction of inspired O_2 (FiO_2) in the respiratory gas.

The O_2 sensor contains an alkaline electrolyte, a lead anode, two gold cathodes, and a plastic membrane. The spatial separation of the two gold cathodes allows to carry out a voltage comparison.

The O_2 sensor is an electrochemical cell which generates a voltage from the ion current.

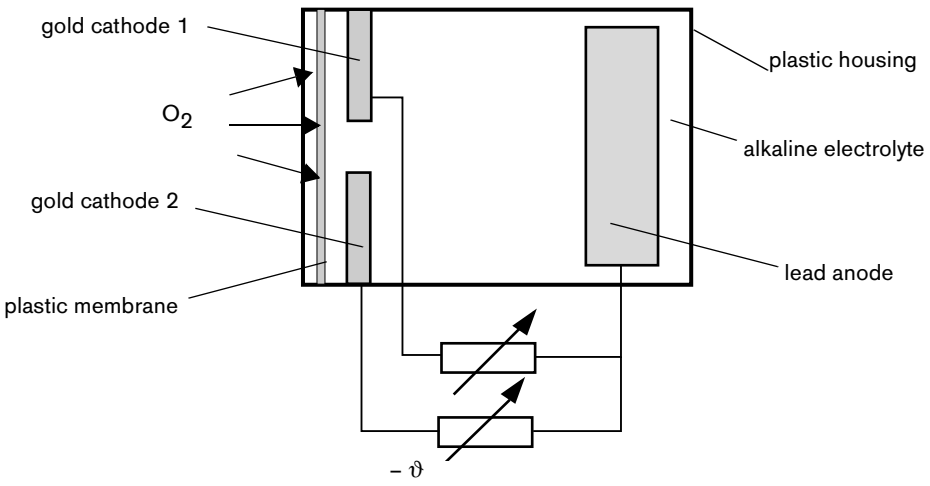


Fig. 40: O_2 sensor

The O_2 to be measured diffuses through the plastic membrane, reacts at the gold cathodes (negative polarity) and forms lead oxide and water at the lead anode (positive polarity). During this chemical process, an electrical voltage is generated which is proportional to the O_2 partial pressure.

The internal resistance is determined by the surface of the gold cathodes, the O_2 diffusion velocity, and the distance between the gold cathodes and the lead anode. The resistance is approximately 700 ohms.

This chemical process is temperature-sensitive. Therefore temperature-sensitive resistors are connected in parallel to the O_2 sensor. These resistors and the internal resistance of the O_2 sensor correct the measuring voltage. Due to the two gold cathodes used in the O_2 sensor cell, two different measuring voltages are generated. These measuring voltages are compared with each other.

If the O_2 sensor fails, the control box will indicate an error on the graphics display.

12 Flow Measurement

A moving screen (moving vane) measures the expiratory flow of the patient. A flow-dependent pressure builds up at the moving vane. This pressure is picked up at the differential pressure sensor (ΔP). The differential pressure sensor converts the pressure into an electronic signal and transmits this signal to the microcontroller.

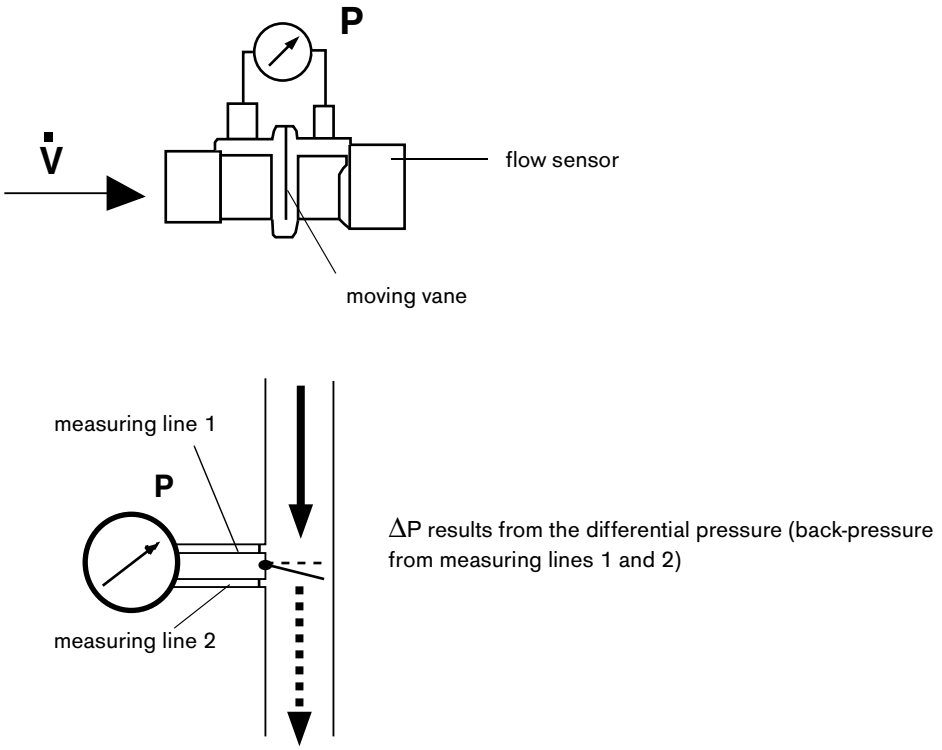


Fig. 41: Flow measurement principle

13 Anesthetic Vaporizer "Vapor 19.n"

Refer to separate technical documentation of the anesthetic vaporizer "Vapor 19.n".

Test list

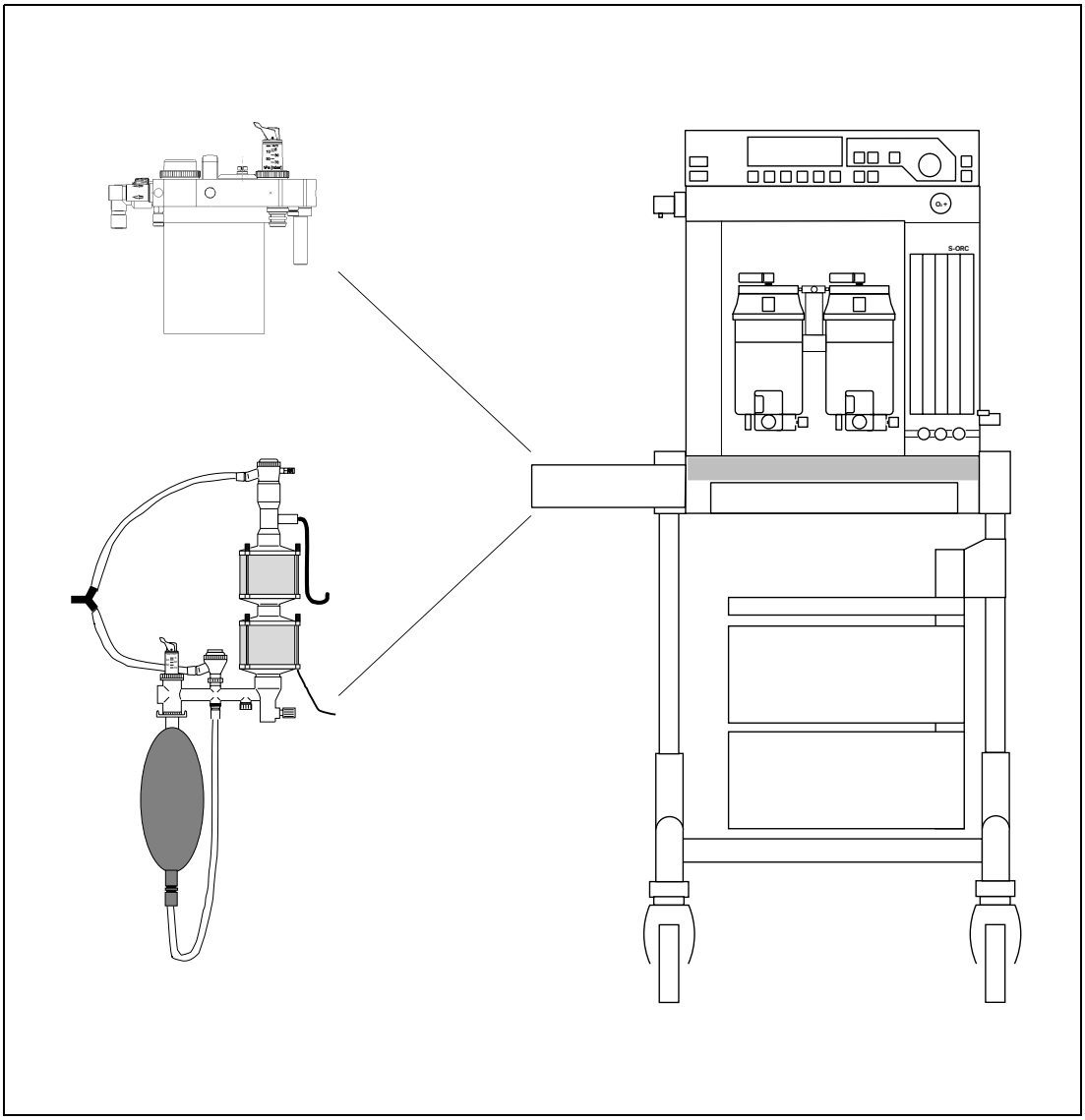
Folder no.:
5330.200
Issue:
02.99

Fabius

Serial no.: _____

Installation site: _____

Fabius



This test list does not replace the inspections and servicing to be carried out by Dräger Medical AG & Co. KGaA

Test list equipment

Service equipment	Measuring range	Accuracy class
Pressure gauge	–30 to +120 mbar	1.6
Pressure gauge	0 to 1.5 bar	1.6
Flowmeter	10 to 120 L/min	1.6
Test pressure reducer		
Hoses, various		
T-piece		
Test thorax		

This test list does not replace the inspections and servicing to be carried out by Dräger Medical AG & Co. KGaA

1 General condition

- Check that the accompanying documents are present. ☐

1.1 Test “Vapor” anaesthetic vaporizer

- Test the “Vapor” anaesthetic vaporizer in accordance with the associated test list. ☐

1.2 “Control box”

- Check that the mains fuses of the “control box” conform to the mains fuse specifications on the rating plate. ☐
- Check that the labels are complete and legible. ☐

1.3 “Ventilator”

- Check the general condition of the “Ventilator”. ☐

Either the “Cosy” compact breathing system or the “Circle system 9/Fabius” circle absorption system may be fitted on the Fabius. Select the appropriate test for your component.

1.3.1 “Cosy” compact breathing system

- Check the general condition of the existing accessories:

– Inspiratory valve

– Expiratory valve

– PEEP valve

– APL valve, “MAN-Spont/IPPV” labelling

– Sockets

– Corrugated hoses

– Manual breathing bag, Resutator

– Patient airway pressure measuring tube

– Y-piece

– Mask

– Absorber ☐

1.3.2 “Circle system 9/Fabius” circle absorption system

- Check the general condition of the existing accessories:

– Circle system carrier

– Inspiratory valve

– Expiratory valve

– PEEP valve

– APL valve, “MAN-Spont/IPPV” labelling

– Sockets

– Corrugated hoses

– Manual breathing bag, Resutator

– Patient airway pressure measuring tube

– Y-piece

– Mask

– Absorber ☐

1.4 Flowmeter block

- Check the general condition of the flowmeter block. ☐

1.5 O_2 sensor

- Check the general condition of the following components:
  - O_2 sensor capsule
  - O_2 sensor connecting cable
  - Connector of the O_2 sensor connecting cable. ☐

1.6 Flow sensor

- Check the general condition of the flow sensor. ☐

1.7 Trolley

- Check the general condition of the trolley. ☐

1.8 Drawers (option)

- Check the general condition of the drawers. ☐

1.9 CS connecting tubes/connectors

- Check the general condition of the central supply system connecting tubes and the compressed gas connectors of the Fabius. ☐

1.10 Compressed gas cylinders and pressure gauges

- Check the general condition of the compressed gas cylinders and the associated pressure gauges. ☐

2 Tests to VDE 0751, part 1

(observe national laws, standards and regulations!)

2.1 Test PE resistance

- Measure the PE resistance.
- Make sure the PE resistance is ≤ 0.2 Ohm. ☐

2.2 Test equivalent device leakage current

- Measure the equivalent device leakage current.
- Make sure all subsequent measurements exceed the initial measured value of the unit by max. 50%, but are ≤ 750 µA. ☐

3 Test Fabius functions

- Connect the Fabius to the compressed gas supply (central supply system/compressed gas cylinders).
- Connect the Fabius to the anaesthetic gas scavenging system.
- Plug the mains plug of the Fabius into the mains socket.
- Switch on the Fabius.
- Check that all LEDs on the control box light up briefly, that the audible alarm sounds and that the Fabius runs through its self-test and then switches to STANDBY mode. ☐

3.1 Mains power failure warning

- Unplug the mains plug of the Fabius from the mains socket.
- Check that the audible alarm sounds briefly and that the battery symbol appears on the control box display. ☐
- Plug the mains plug of the Fabius into the mains socket.
- Check that the Power On symbol appears on the control box display. ☐

3.2 O_2 sensor calibration and flow sensor calibration

- Detach the O_2 sensor from the inspiratory valve.
- Press the Calibration key on the control box.
- Select O_2 sensor calibration.
- Calibrate the O_2 sensor.
- Check that the O_2 sensor is calibrated after a maximum of 4 minutes. ☐
- Select flow sensor calibration.
- Calibrate the flow sensor.
- Check that the flow sensor is calibrated after approx. 2 seconds. ☐
- Switch on the Fabius by the power switch.

3.3 Test gas type (compressed gas cylinders)

- Disconnect the Fabius from the compressed gas cylinders/central supply system.
- Open all flow control valves of the flowmeter block.
- Hold the O_2-Flush key of the Fabius pressed down until you can hear that no more gas is flowing.

The compressed gas remaining in the Fabius escapes. The Fabius is depressurised.

- Check that the pressure gauges indicate 0 bar after approx. 2 seconds. ☐
- Close all flow control valves of the flowmeter block.

3.3.1 O_2 compressed gas cylinder

- Connect the O_2 compressed gas cylinder to the Fabius.
- Open the valve of the O_2 compressed gas cylinder.
- Set the flow control valves (N_2O, AIR (option)) of the flowmeter block to maximum.
- Set the O_2 flow control valve to 0.8 L/min.
- Check that the float of the O_2 flowmeter is indicating the pre-set flow of 0.8 L/min. The N_2O and AIR (option) floats indicate 0 L/min. ☐
- Close the AIR flow control valve (option).

3.3.2 N_2O compressed gas cylinder

- Connect the N_2O compressed gas cylinder to the Fabius.
- Open the valve of the N_2O compressed gas cylinder. (Note: The valve of the O_2 compressed gas cylinder is open and the O_2 flow control valve is set to 0.8 L/min).
- Check that the float of the N_2O flowmeter is indicating a flow of approx. 2.5 L/min. ☐
- Close the valve of the N_2O compressed gas cylinder.
- Check that the float on the N_2O flowmeter slowly falls to 0 L/min. ☐
- Check that the float of the O_2 flowmeter is indicating approx. 0.8 L/min. ☐
- Close the valve of the O_2 compressed gas cylinder.

3.4 Testing gas type (central supply system)

- Disconnect the Fabius from the central supply system/compressed gas cylinders.
- Open all flow control valves of the flowmeter block.
- Hold the O_2-Flush key on the Fabius pressed down until you can hear that no more gas is flowing.
- Check that the remaining compressed gas in the Fabius escapes. The Fabius is depressurised. ☐
- Close all flow control valves of the flowmeter block.

3.4.1 O_2 (central supply system)

- Plug the O_2 connector of the Fabius into the O_2 terminal unit.
- Set the flow control valves (N_2O, AIR (option) of the flowmeter block to maximum.
- Set the O_2 flow control valve to 0.8 L/min.
- Check that the float of the O_2 flowmeter is indicating a flow of 0.8 L/min. The N_2O and AIR (option) floats indicate 0 L/min. ☐

3.4.2 N_2O (central supply system)

- Plug the N_2O connector of the Fabius into the N_2O terminal unit.
- Set the O_2 flow control valve to 0.8 L/min.
- Check that the float of the N_2O flowmeter is indicating a flow of approx. 2.5 L/min. ☐
- Unplug the N_2O connector of the Fabius from the N_2O terminal socket.
- Check that the float of the N_2O flowmeter slowly falls to 0 L/min. The float of the O_2 flowmeter indicates approx. 0.8 L/min. ☐
- Close the flow control valves (N_2O, AIR (option)) of the flowmeter block.

3.5 Test O_2 shortage warning

- Connect an O_2 compressed gas cylinder with a test pressure reducer to the “Central supply system” O_2 inlet of the Fabius.
- Set a pressure of 5 bar with the test pressure reducer. (Note: Read off the pressure from the test pressure reducer pressure gauge.)
- Set the O_2 flow control valve of the flowmeter block to 1 L/min.
- Slowly close the test pressure reducer.
- Check that the audible O_2 shortage warning sounds when approx. 1.7 bar is reached. If you continue closing the test pressure reducer, the audible O_2 shortage warning slowly fades. ☐
- Slowly open the test pressure reducer.
- Check that the audible O_2 shortage warning mutes when the pressure reaches approx. 2.6 bar. ☐
- Remove the compressed gas cylinders with test pressure reducer from the “Central supply system” O_2 inlet of the Fabius.
- Close the O_2 flow control valve of the flowmeter block.
- Connect the O_2 compressed gas supply (central supply system/compressed gas cylinder) to the Fabius.

3.6 Test O_2 shortage warning time

- Leave the Fabius connected to the O_2 compressed gas supply for 15 seconds. (Note: Vessel filling time of the volume).
- Disconnect the O_2 compressed gas supply from the Fabius.
- Hold the O_2-Flush key pressed down.
- Check that the O_2 shortage warning time is active for longer than 7 seconds. ☐
- Reconnect the Fabius to the O_2 compressed gas supply.

3.7 Test O_2 flush

- Unscrew the fresh gas hose from the fresh gas outlet of the Fabius.
- Connect the fresh gas outlet to a flowmeter (measuring range up to 120 L/min).
- Hold the O_2-Flush key pressed down.
- Check at a dynamic compressed gas supply of 5 bar that the connected flowmeter is indicating a flow of between 40 L/min and 75 L/min. ☐
- Check at a dynamic compressed gas supply of 3 bar that the connected flowmeter is indicating a flow of between 25 L/min and 65 L/min. ☐
- Release the O_2-Flush key.
- Check that the O_2-Flush key returns to its rest position. There is no more flow through the fresh gas outlet of the Fabius. ☐
- Remove the connected flowmeter from the fresh gas outlet.
- Screw the fresh gas hose back on to the fresh gas outlet.

3.8 Test flowmeter block

- Check that the Fabius is installed horizontally. ☐
- Connect the Fabius to N_2O and AIR (option) from the central supply system/compressed gas cylinders.
- Check that the protective glass of the flowmeter block is undamaged. ☐
- Check that the pressure gauges of the flowmeter block are undamaged. ☐
- Check that the pressure gauges of the flowmeter block are indicating the current gas pressure of the compressed gas supply lines. ☐
- Open the flow control valves (O_2, N_2O, AIR (option)) fully and reduce the maximum flow in four separate stages to 0 L/min. Check that the floats of the flowmeters do not get stuck at any point. ☐
- Close all flow control valves.

3.8.1 Test flow control valves

- Check that the country-specific, colour-coded and haptic identifiers are accurate. ☐

3.8.2 Test full-scale value of flow control valves

- If fitted, fully open only the flow control valve for AIR. Check that the maximum flow indicated on the flowmeter for AIR is > 14 L/min. ☐
- Fully open the flow control valves (O_2, N_2O).
- Check that the maximum flow indicated on the flowmeters (O_2, N_2O, AIR (option)) is > 9 L/min. ☐
- Close the flow control valves.

3.9 Test S-ORC

- Disconnect the “Vapor” anaesthetic vaporizer.
- Open the N_2O flow control valve fully.
- Open the O_2 flow control valve fully and then close it again.
- Check that the N_2O flowmeter is indicating a N_2O flow of 0 L/min. ☐
- Set the O_2 flow control valve to a flow of 0.2 L/min.
- Check that the N_2O begins to flow. ☐
- Set the O_2 flow control valve to a flow of 0.5 L/min.
- Check that the N_2O flowmeter is indicating a N_2O flow between 1.2 L/min and 1.8 L/min. ☐
- Set the O_2 flow control valve to a flow of 3.0 L/min.
- Check that the N_2O flowmeter is indicating a N_2O flow between 6.0 L/min and 10.0 L/min. ☐
- Refit the “Vapor” anaesthetic vaporizer on the Fabius.
- Close the O_2 flow control valve.
- Close the N_2O flow control valve.

3.10 Check for leaks

- Disconnect the Fabius from the central supply system/compressed gas cylinders.
- Open all flow control valves of the flowmeter block.
- Hold the O_2-Flush key of the Fabius pressed down until you can hear that no more gas is flowing.
- Check that the remaining compressed gas in the Fabius escapes. The Fabius is depressurised. ☐
- Close all flow control valves.

3.10.1 Check for leaks in the Fabius with compressed gas cylinders

- Connect the O_2 compressed gas cylinder to the O_2 compressed gas cylinder inlet of the Fabius.
- Connect the N_2O compressed gas cylinder to the N_2O compressed gas cylinder inlet of the Fabius.
- Remove the connecting tubes of the central supply system.
- Open the O_2 compressed gas cylinder valve.
- Check that the downstream pressure of the O_2 compressed gas cylinder is approx. 5 bar. ☐
- Open the N_2O compressed gas cylinder valve.
- Check that the downstream pressure of the N_2O compressed gas cylinder is approx. 5 bar. ☐
- After equalising the pressure, close the O_2 compressed gas cylinder valve.
- After equalising the pressure, close the N_2O compressed gas cylinder valve.
- Check that the pressure indicated on the pressure gauges of the compressed gas cylinders does not drop by more than 10 bar within 2 minutes. ☐

Either the “Cosy” compact breathing system or the “Circle system 9/Fabius” circle absorption system may be fitted on the Fabius. Select the appropriate test for your component.

3.10.2 Check for leaks in the “Cosy” compact breathing system

The leaktightness of the “Cosy” compact breathing system is tested once **with** and once **without** the “Vapor” anaesthetic vaporizer. (Note: For the leak test with the “Vapor” anaesthetic vaporizer set the handwheel to 0.)

- Open the O_2 compressed gas cylinder valve.
- Open the N_2O compressed gas cylinder valve.
- Switch on the Fabius by the power switch.
- On the control box press the “MAN/SPONT” key.
- Detach the manual breathing bag from its connection port.
- Plug the free end of the breathing tube onto the Y-piece.
- Check that the O_2 sensor is plugged into the “Cosy” compact breathing system. If it is not, plug in the O_2 sensor.
- Switch the APL valve to “MAN”.
- Set the APL valve to 70 hPa (mbar).
- Hold the O_2-Flush key pressed down until a pressure of 25 to 30 hPa (mbar) builds up. The pressure can be read from the control box display.
- Set the O_2 flow control valve to 0.12 L/min.
- Check whether the pressure rises or remains constant. ☐
- Open the patient connection port again.
- Reconnect the breathing bag.
- Close the O_2 flow control valve.
- Close the N_2O compressed gas cylinder valve.

3.10.3 Check for leaks in the circle absorption system

The leaktightness of the “Circle system 9/Fabius” circle absorption system is tested once **with** and once **without** the “Vapor” anaesthetic vaporizer. (Note: For the leak test with the “Vapor” anaesthetic vaporizer set the handwheel to 0.)

- Open the O_2 compressed gas cylinder valve.
- Open the N_2O compressed gas cylinder valve.
- Switch on the Fabius by the power switch.
- On the control box press the “MAN/SPONT” key.
- Detach the manual breathing bag from its connection port.
- Plug the free end of the breathing tube onto the Y-piece.
- Check that the O_2 sensor is plugged into the “Cosy” compact breathing system. If it is not, plug in the O_2 sensor.
- Switch the APL valve to “MAN”.
- Set the APL valve to 70 hPa (mbar).
- Hold the O_2-Flush key pressed down until a pressure of 25 to 30 hPa (mbar) builds up. The pressure can be read from the control box display.
- Set the O_2 flow control valve to 0.12 L/min.
- Check whether the pressure measured at the inspiratory valve rises or remains constant. ☐
- Open the patient connection port again.
- Reconnect the breathing bag.
- Close the O_2 flow control valve.
- Close the N_2O compressed gas cylinder valve.

3.11 Test low pressure

3.11.1 Flowmeter safety valve

- Disconnect the “Vapor” anaesthetic vaporizer.
- Unscrew the fresh gas hose from the fresh gas outlet.
- Connect the fresh gas outlet port to a separate pressure gauge.
- With the O_2 flow control valve set an O_2 flow of 9 L/min.
- Check that the safety valve opens at a pressure of approx. 1 bar. (Note: Read off the pressure from the separately connected pressure gauge.) ☐
- Close the O_2 flow control valve.
- Remove the separately connected pressure gauge.

3.11.2 Test low pressure without “Vapor” anaesthetic vaporizer

- Vent the gas systems (N_2O, AIR) by fully opening the flow control valves (N_2O, AIR).
- Connect the fresh gas outlet to a separate pressure gauge.
- Close the N_2O flow control valve.
- Set the O_2 flow control valve such that a pressure of approx. 120 mbar is produced on the separate pressure gauge.
- Check that the float of the O_2 flowmeter is indicating a flow of < 0.1 L/min. ☐
- Refit the “Vapor” anaesthetic vaporizer on the Fabius.
- Close the O_2 flow control valve.

3.11.3 Test low pressure with “Vapor” anaesthetic vaporizer

- Switch on the “Vapor” anaesthetic vaporizer (setting higher than 0.2 vol.%).
- Vent the gas systems (N_2O, AIR) by fully opening the flow control valves (N_2O, AIR).
- Connect the fresh gas outlet to a separate pressure gauge.
- Close the N_2O flow control valve.
- Set the O_2 flow control valve such that a pressure of approx. 120 mbar is produced on the separate pressure gauge.
- Check that the float of the O_2 flowmeter is indicating a flow of < 0.1 L/min. ☐
- Close the O_2 flow control valve.

3.12 Test ventilator

- Plug the mains plug of the Fabius into the mains socket.
- Switch on the Fabius by the power switch.

3.12.1 Test machine breathing

- Connect a test thorax or a breathing bag.
- Set AIR to approx. 3 L/min.
- Select “IPPV” mode.
- Check that the Fabius ventilates in “IPPV” mode. The ventilator moves up and down unhindered according to the set tidal volume (VT) and the frequency. ☐

3.12.2 Test manual breathing

- Select “MAN/Spont” mode.
- Check that manual breathing is possible with the manual breathing bag. ☐

3.12.3 Test spontaneous breathing

- Check that you can simulate spontaneous breathing with the test thorax. ☐

4 Assembly the Fabius ready for operation.

Date: _____ Name: _____

This test list does not replace the inspections and servicing to be carried out by Dräger Medical AG & Co. KGaA

1 General Warnings, Cautions and Recommendations

Risk of infection! To protect yourself from communicable diseases, clean and disinfect Fabius and its components/accessories according to approved hospital procedures before servicing or shipping for repair.

Risk of electric shock! Unplug the power cord before opening Fabius, the ventilator, or the control box for servicing.

Risk of malfunction! Spare items from another manufacturer can affect the device's function. Use only spare parts supplied or recommended by Dräger Medical AG & Co. KGaA.

Risk of injury! Any battery may rupture or explode if put in a fire or otherwise exposed to excessive heat. Do not expose batteries to excessive heat.

Risk of injury! Batteries contain harmful chemicals. Do not force open and do not let any material leaked from a battery come into contact with eyes or skin.

Dispose of batteries according to local waste disposal regulations.

Spent O_2 sensors can be returned to Dräger Medical AG & Co. KGaA, Lübeck/Germany.

2 Maintenance Intervals

Observe the following maintenance intervals:

2.1 Regular Safety Checks

Item	Procedure/Intervals
Circle absorption system "Circle System 9/Fabius"	Check at regular intervals.
Anesthetic vaporizer "Vapor 19.n"	Check at regular intervals.
Sensors (O_2 sensor, flow sensor)	Check at regular intervals.
Fabius	Check at regular intervals.

2.2 Maintenance as Applicable

Item	Procedure/Intervals
O_2 sensor	Replace, if calibration is no longer possible.
Pressure-measuring hose	Replace, if damaged.
Flow sensor	Replace, if calibration is no longer possible.

Spent O_2 sensors can be returned to Dräger Medical AG & Co. KGaA, Lübeck/Germany.

2.3 Maintenance at 6-Month Intervals

Item	Procedure/Intervals
Circle absorption system "Circle System 9/Fabius"	To be maintained by trained service personnel at six-month intervals.
Anesthetic vaporizer "Vapor 19.n"	To be maintained by trained service personnel at six-month intervals.
Sensors (O_2 sensor, flow sensor)	To be maintained by trained service personnel at six-month intervals.
Fabius	To be maintained by trained service personnel at six-month intervals.

2.4 Maintenance at 12-Month Intervals

Item	Procedure/Intervals
Bacterial filter of pressure-measuring hose	Replace at 12-month intervals.
Pressure-measuring hose, flow-measuring hoses	Replace at 12-month intervals.
Bag rolling diaphragm in ventilator	Replace at 12-month intervals.

Risk of infection! Used bacterial filters can communicate diseases. Dispose of bacterial filters according to approved hospital procedures.

2.5 Maintenance at 3-Year Intervals

Item	Procedure/Intervals
Rechargeable battery in control box	If fitted, to be replaced by trained service personnel at 3-year intervals.
Rechargeable batteries of the uninterruptible power supply (UPS)	To be replaced by trained service personnel at 3-year intervals.
O-rings and diaphragms in ventilator	To be replaced by trained service personnel at 3-year intervals.

2.5.1 Disposing of Batteries

Risk of injury! Batteries contain harmful chemicals. Do not force open and do not let any material leaked from a battery come into contact with eyes or skin.

Risk of injury! Any battery may rupture or explode if put in a fire or otherwise exposed to excessive heat. Do not expose batteries to excessive heat.

Dispose of batteries according to local waste disposal regulations.

2.6 Maintenance at 6-Year Intervals

Item	Procedure/Intervals
Pressure regulators	To be submitted to a general overhaul by trained service personnel at 6-year intervals.

2.6.1 Disposing of Pressure Regulators

Dispose of pressure regulators according to local waste disposal regulations.

3 O_2 Sensor

Replace the O_2 sensor with a new one if calibration is no longer possible.

3.1 Removing/Replacing the O_2 Sensor

- Switch off Fabius using the ON/OFF switch (on the rear panel of the control box).
- Unplug the O_2 sensor connector from the O_2 sensor input port **1** on the control box.

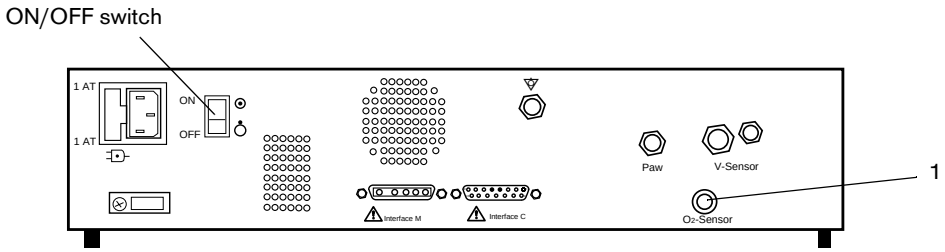


Fig. 1: Rear View of the Control Box (ON/OFF switch and O_2 sensor input port)

- Unscrew the O_2 sensor assembly **1** from the inspiratory valve.

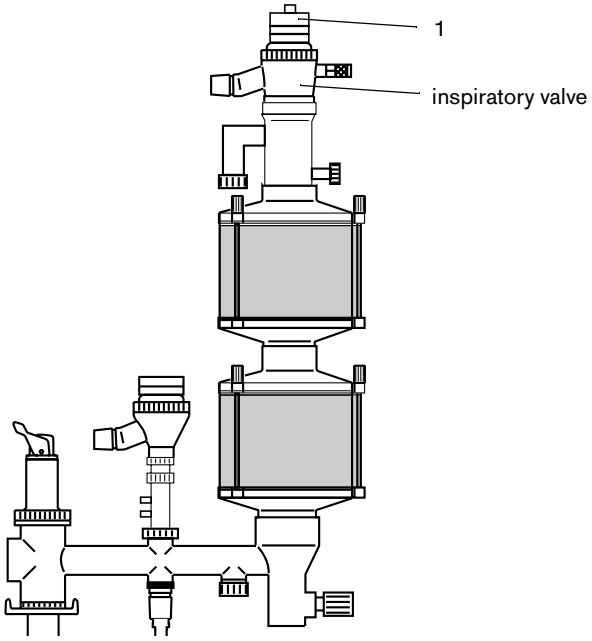


Fig. 2: Circle Absorption System "Circle System 9/Fabius" (removing the O_2 sensor assembly)

- Unscrew the O_2 sensor cap from the O_2 sensor housing.

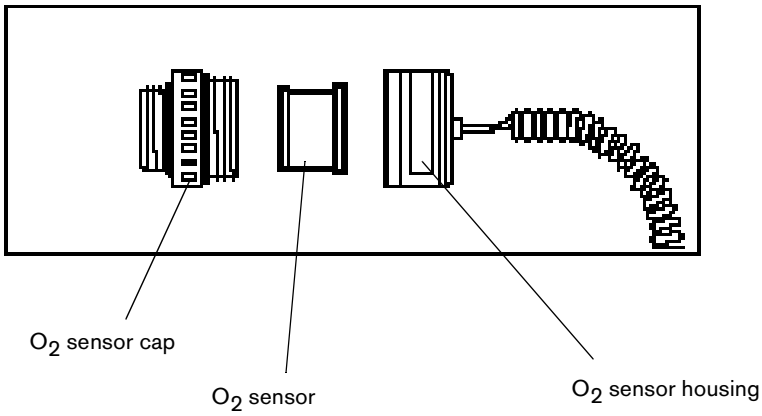


Fig. 3: Unscrewing the O_2 Sensor Cap from the O_2 Sensor Housing

- Replace the spent O_2 sensor with a new one.
- Mount the new O_2 sensor using the reverse method of that used for dismounting.
- Screw the O_2 sensor assembly onto the inspiratory valve of the circle absorption system.

- Plug the O_2 sensor connector into the O_2 sensor input port on the control box.
- Switch on Fabius using the ON/OFF switch.
- Calibrate the O_2 sensor in the STANDBY mode.

3.2 Disposing of Spent O_2 Sensors

Risk of injury! O_2 sensors contain harmful chemicals. Do not force open and do not let any material leaked from an O_2 sensor come into contact with eyes or skin.

Risk of injury! Any O_2 sensor may rupture or explode if put in a fire or otherwise exposed to excessive heat. Do not expose O_2 sensors to excessive heat.

Dispose of spent O_2 sensors according to local waste disposal regulations.

Spent O_2 sensors can be returned to Dräger Medical AG & Co. KGaA, Lübeck/Germany.

4 Flow Sensor

Replace the flow sensor with a new one when calibration is no longer possible.

4.1 Removing/Replacing the Flow Sensor

- Switch off Fabius using the ON/OFF switch (on the rear panel of the control box).

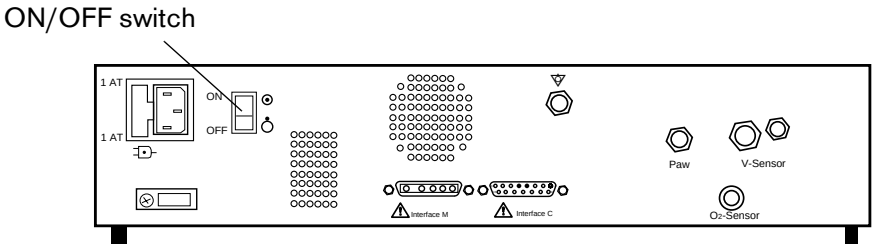


Fig. 4: Rear View of the Control Box (ON/OFF switch)

- Turn the union nut **1** counter-clockwise (upwards).
- Remove the flow sensor **2** from its mount.

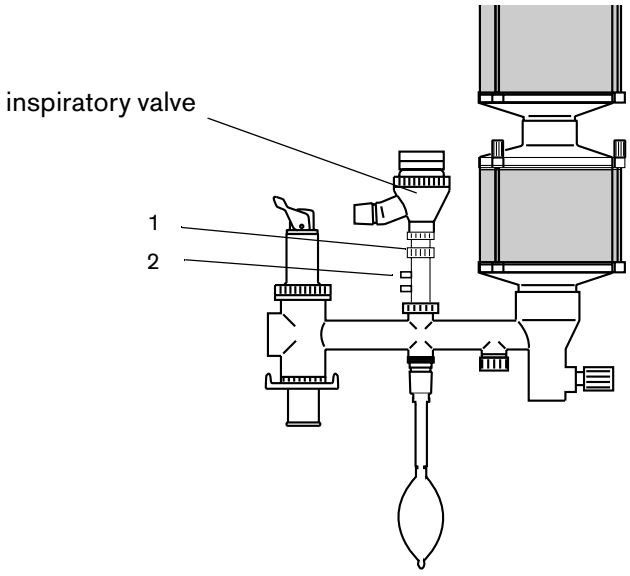


Fig. 5: Circle Absorption System "Circle System 9/Fabius" (removing the flow sensor)

- Disconnect the flow measuring hoses from the flow sensor.
- Replace the flow sensor with a new one.
- Install the flow sensor correctly into the circle absorption system (see Figure below).
- To secure the flow sensor in place, turn the union nut clockwise (downward) as far as it will go.

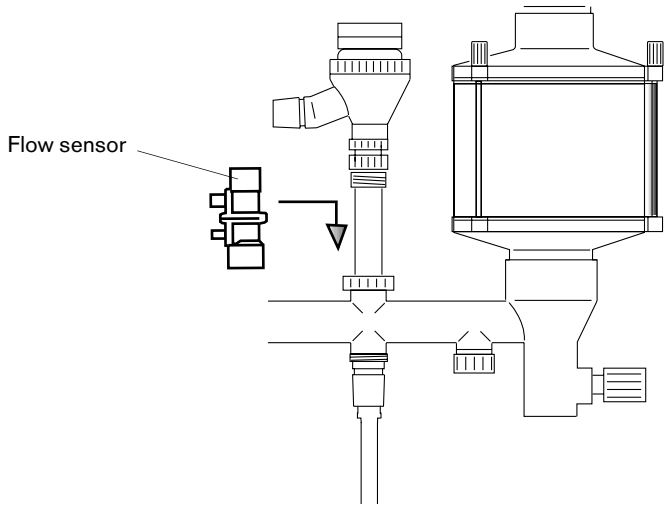


Fig. 6: Circle Absorption System "Circle System 9/Fabius" (installing the flow sensor)

- Connect the flow measuring hoses to the flow sensor.
- Switch on Fabius using the ON/OFF switch.
- Calibrate the flow sensor in the STANDBY mode.

4.2 Disposing of the Spent Flow Sensors

Dispose of spent flow sensors according to local waste disposal regulations.

5 Rechargeable Battery in the Control Box

- If fitted, replace the rechargeable battery for mains failure alarm (in the control box) with a new one at 3-year intervals.

Risk of injury! Batteries contain harmful chemicals. Do not force open and do not let any material leaked from a battery come into contact with eyes or skin.

Risk of injury! Any battery may rupture or explode if put in a fire or otherwise exposed to excessive heat. Do not expose batteries to excessive heat.

5.1 Removing/Replacing the Rechargeable Battery in the Control Box

Electrostatic discharge can damage electrostatic sensitive devices. Use a static-dissipative mat and a wrist strap when handling electrostatic sensitive devices.

- Switch off Fabius using the ON/OFF switch (on the rear panel of the control box).
- Disconnect the power plug of Fabius from the mains socket-outlet.

- Remove the fixing screws **1** from the control box.
- Pull the top cover **2** slightly apart at the rear edges, lift it up in direction of **A**, and place it aside.

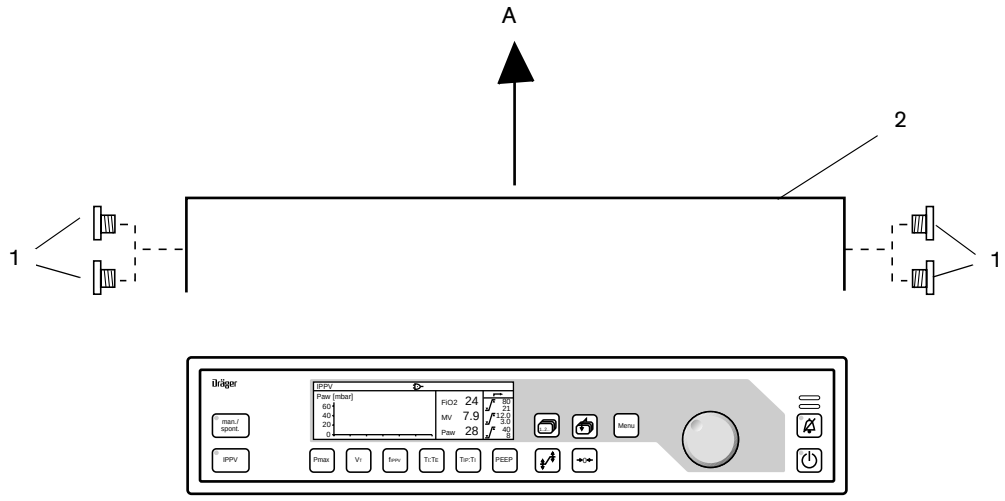


Fig. 7: Front View of the Control Box (removing the top cover)

- Cut off the cable tie **3** which holds the battery in place.

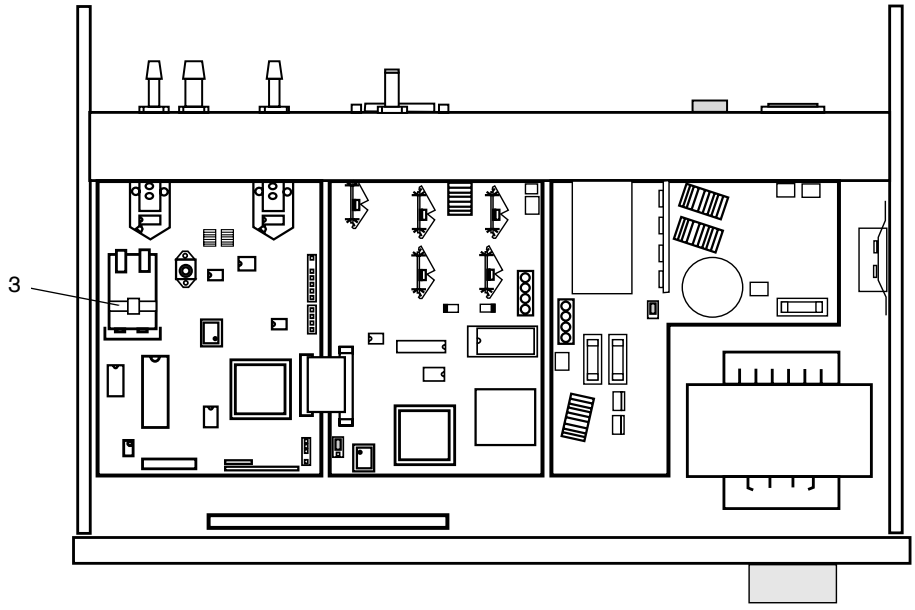


Fig. 8: Top View of the Control Box (top cover removed), Removing the Cable Tie

- Replace the rechargeable battery with a new one (make sure the new rechargeable battery is installed in the correct position).

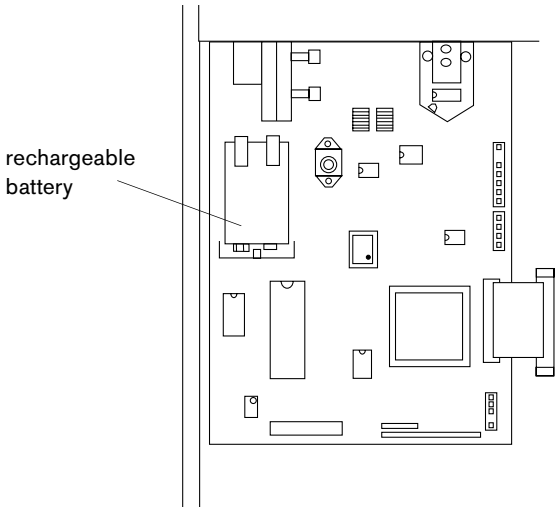


Fig. 9: Top View of the Control PCB

- Secure the new rechargeable battery with a new cable tie.
- Cut off any protruding length of cable tie.
- Mount the top cover onto the control box.
- Connect the power plug of Fabius to the mains socket-outlet.
- Switch on Fabius and allow the new rechargeable battery to recharge for at least one hour.

5.2 Disposing of the Rechargeable Battery in the Control Box

Dispose of spent rechargeable batteries according to local waste disposal regulations.

6 Rechargeable Batteries of the Uninterruptible Power Supply (UPS)

- Replace the rechargeable batteries of the UPS with new ones at 3-year intervals.

Risk of injury! Batteries contain harmful chemicals. Do not force open and do not let any material leaked from a battery come into contact with eyes or skin.

Risk of injury! Any battery may rupture or explode if put in a fire or otherwise exposed to excessive heat. Do not expose batteries to excessive heat.

6.1 Removing/Replacing the Rechargeable Batteries of the UPS

Electrostatic discharge can damage electrostatic sensitive devices. Use a static-dissipative mat and a wrist strap when handling electrostatic sensitive devices.

- Switch off Fabius by using the ON/OFF switch (on the rear panel of the control box).
- Disconnect the power plug of Fabius from the mains socket-outlet.
- Press the cover plate against Fabius to prevent it from falling down and unscrew the fixing screws **1**.
- Place the cover plate aside.

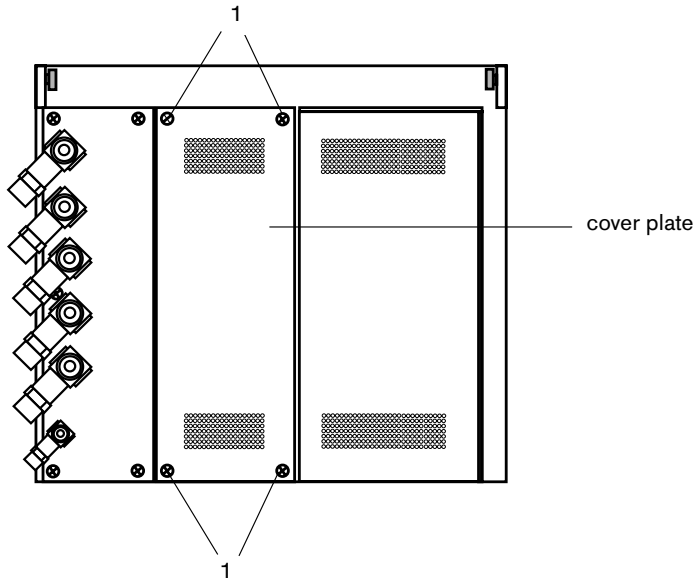


Fig. 10: Rear View of Fabius (removing the cover plate)

- Disconnect the cable connector **1**.
- Remove nut **2** and **3** from the rechargeable batteries.

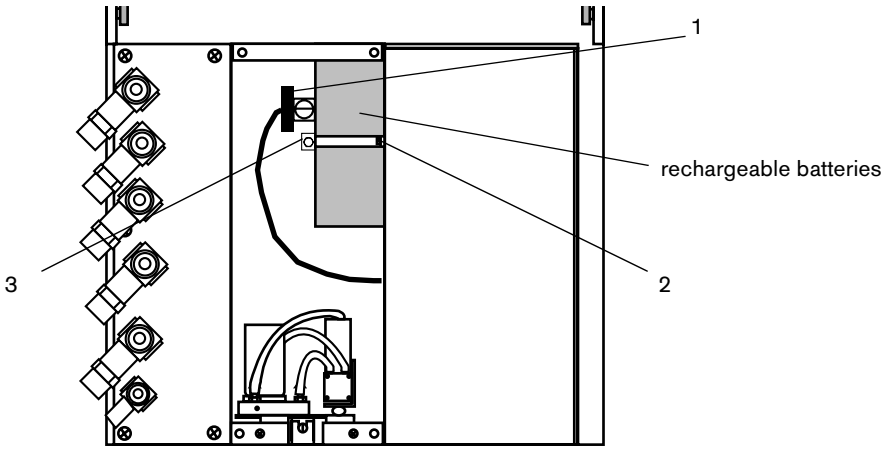


Fig. 11: Rear View of Fabius (cover plate removed), Removing the Rechargeable Batteries

- If fitted, cut the cable tie using a diagonal cutter or a similar tool (**make sure you do not cut the connecting cables of the rechargeable batteries**).
- Write down the configuration of the cable lugs for later reassembly.
- Remove the cable lugs from the cable connections.
- Replace the rechargeable batteries with new ones.
- Tie the connecting cables of the rechargeable batteries together using a new cable tie.
- Install the new rechargeable batteries into Fabius (**connect the grounding cable to the nut 2, see Figure above**).
- Connect the cable connector **1**.
- Mount the cover plate.
- Connect the power plug of Fabius to the mains socket-outlet.
- Switch on Fabius and allow rechargeable batteries to recharge for four hours.

6.2 Disposing of Rechargeable Batteries of the UPS

Dispose of spent rechargeable batteries according to local waste disposal regulations.

7 Pressure Regulators

- Replace the O_2 and N_2O pressure regulators, and the optional AIR pressure regulator with new ones at 6-year intervals.

7.1 Removing/Replacing the Pressure Regulators

- Switch off Fabius using the ON/OFF switch (on the rear panel of the control box).
- Disconnect the power plug from the mains socket-outlet.
- Disconnect the gas connectors from the terminal units/gas cylinders.
- Remove the fixing screws **1**.
- Pull the plug-in unit **2** slightly towards you.

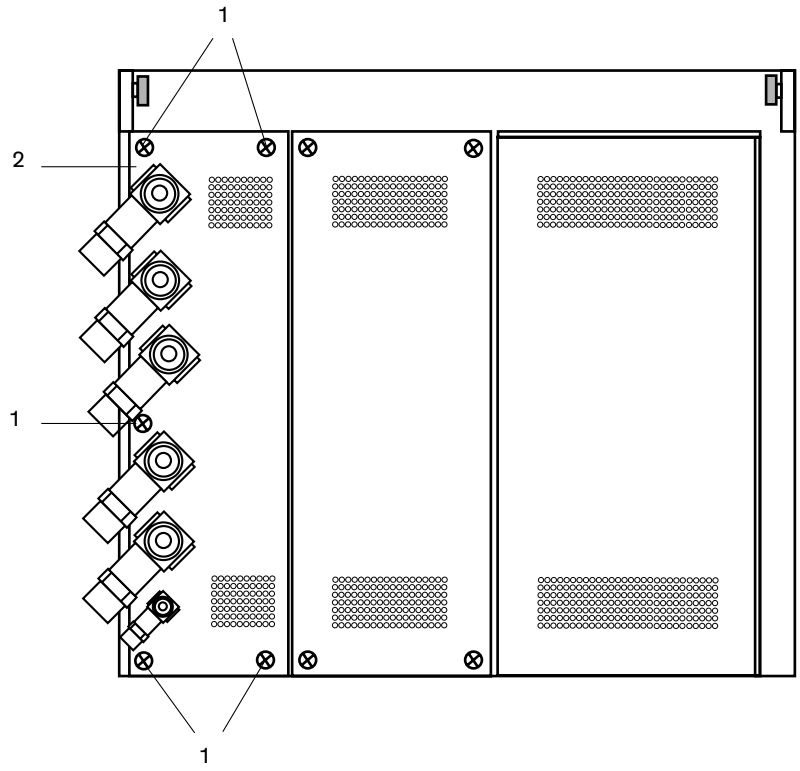


Fig. 12: Rear View of the Fabius (removing the fixing screws)

- Mark the hoses of the pressure regulator to be replaced, e.g. using adhesive tape, in order to avoid interchanging of input and output hoses of the pressure regulator when mounting the new pressure regulator.

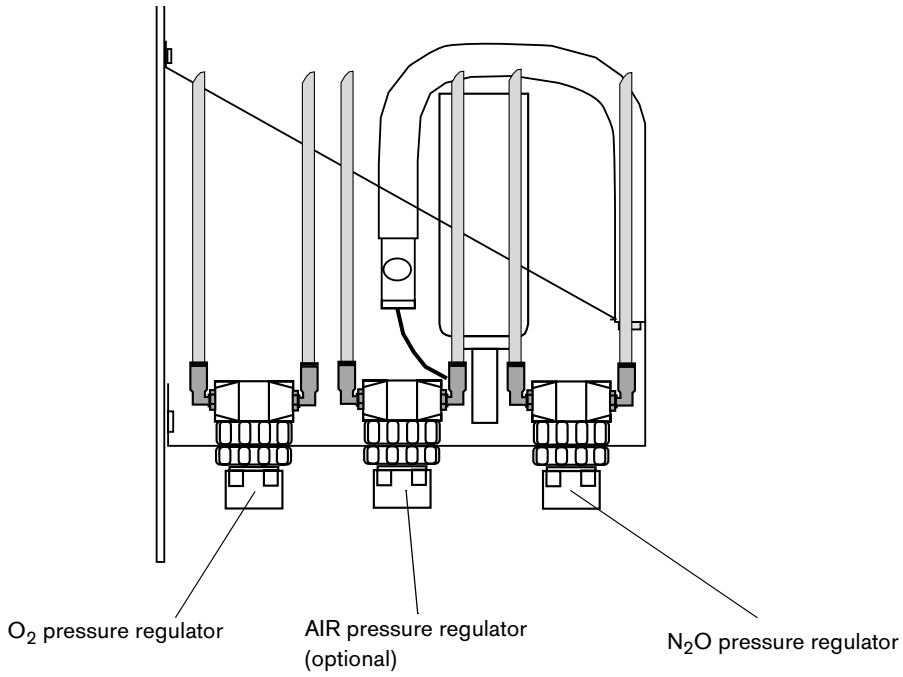


Fig. 13: Side View of the Plug-In Unit (location of the hoses)

- Disconnect the hoses **1** of the respective pressure regulator by pushing in the retaining rings **2** and pulling out the hoses **1** simultaneously.
- Remove the lock nut.

Dispose of the pressure regulators according to local waste disposal regulations.

- Secure the new pressure regulator using the lock nut.

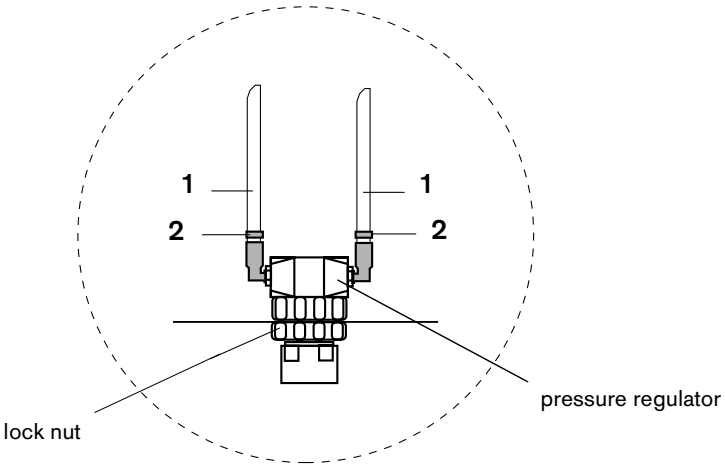


Fig. 14: Pressure Regulator (disconnecting the hoses)

- Before installing the new pressure regulator, unlock it by first pulling the adjusting ring **1** in direction **A** and then turning the adjusting ring **1** counter-clockwise in direction **B** as far as it will go.

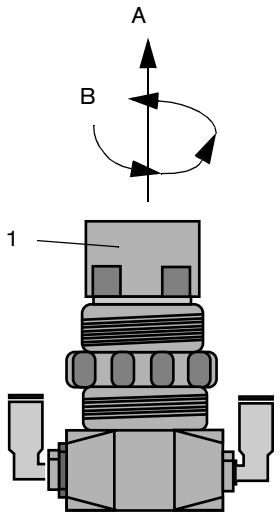
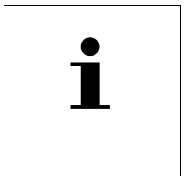


Fig. 15: Unlocking the Pressure Regulator

- Use a T-piece to connect a separate pressure gauge (measuring range: 0 to 6 bar) to the output port of the O_2 pressure regulator.
- Using a test pressure regulator, deliver a flow of 3 L/min to the O_2 input port of Fabius.
- Using the adjusting ring **1**, set the O_2 pressure regulator to 3.0 bar ±0.2 bar (the pressure regulator can be opened by turning the adjusting ring clockwise).
- Push the adjusting ring **1** downward in order to lock the O_2 pressure regulator.
- Use a T-piece to connect a separate pressure gauge (measuring range: 0 to 6 bar) to the output port of the N_2O pressure regulator.
- Using a test pressure regulator, deliver a flow of 3 L/min to the N_2O input port of Fabius.
- Using the adjusting ring **1**, set the N_2O pressure regulator to 2.0 bar ±0.2 bar (the pressure regulator can be opened by turning the adjusting ring clockwise).
- Push the adjusting ring **1** downward in order to lock the N_2O pressure regulator.
- Use a T-piece to connect a separate pressure gauge (measuring range: 0 to 6 bar) to the output port of the (optional) AIR pressure regulator.
- Using a test pressure regulator, deliver a flow of 3 L/min to the (optional) AIR input port of Fabius.
- Using the adjusting ring **1**, set the AIR pressure regulator to 1.5 bar ±0.2 bar (the pressure regulator can be opened by turning the adjusting ring clockwise).
- Push the adjusting ring **1** downward in order to lock the AIR pressure regulator.

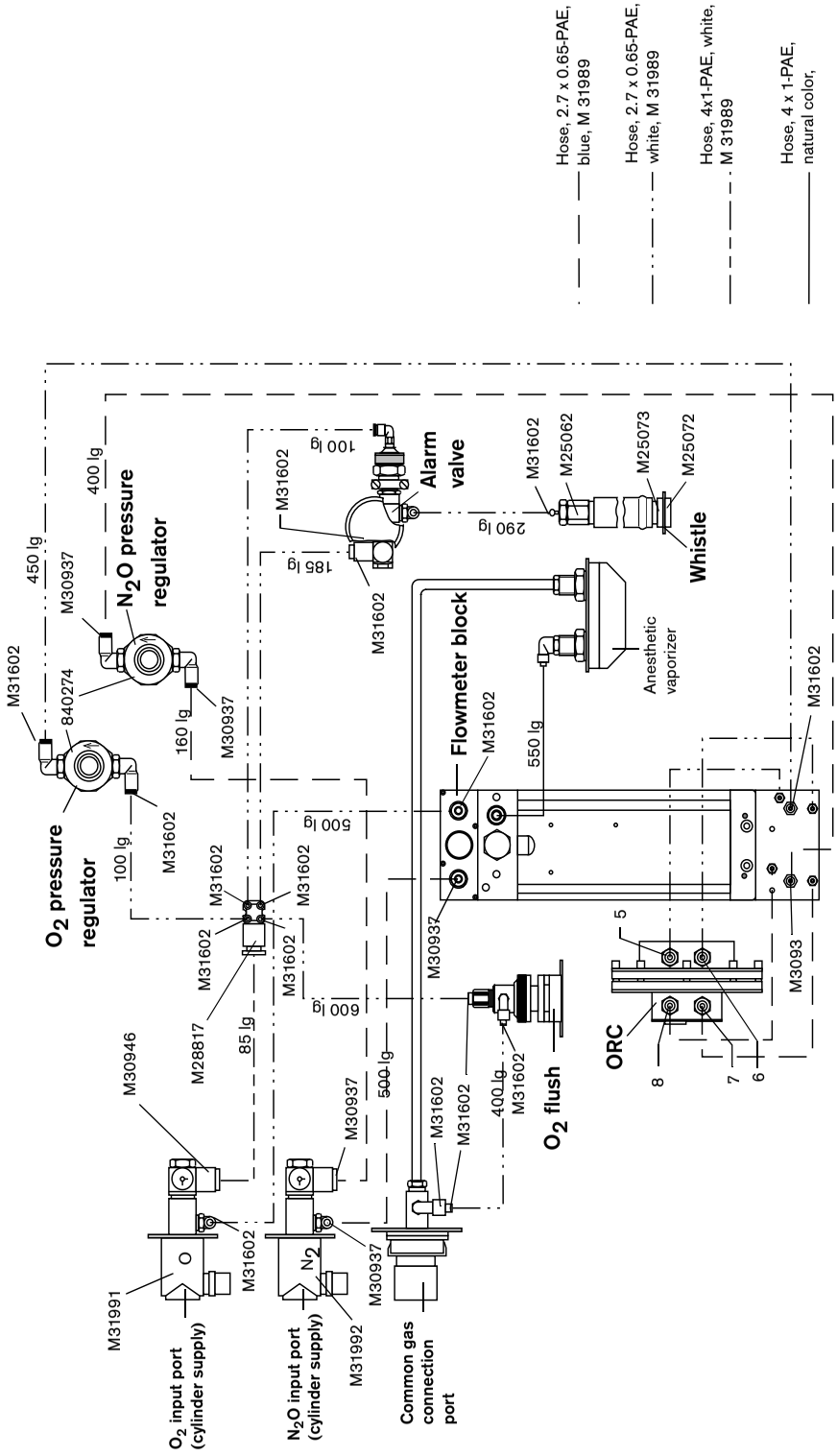
- Remove the T-piece and the separate pressure gauge.
- Check that the hose system is free of leaks (for example with a leak detector spray).
- Reassemble Fabius using the reverse method of that used for disassembly.

7.2 Disposing of Pressure Regulators



Dispose of the pressure regulators according to local waste disposal regulations.

1 Fabius Tubing Diagram



1 Fault - Cause - Remedy

Fault	Cause	Remedy
A continuous audible alarm is given. No visible alarm appears on the display.	Fabius is not connected to mains power supply.	Connect Fabius to mains power supply.
	The rechargeable batteries are flat.	Recharge the batteries.
	Machine fault.	Inform DrägerService.
APNEA PRESSURE	Inappropriate fresh-gas supply.	Ensure appropriate fresh-gas supply.
	No ventilation.	
	Leak in hose system.	Check hose system.
APNEA VOLUME	No ventilation – no expired volume for 15 seconds.	Check ventilator.
	Inappropriate fresh-gas supply.	Ensure appropriate fresh-gas supply.
	Kinked hose.	Check hose system.
	Leak in hose system.	Check hose system.
APNEA PRESS OFF	The lower alarm limit for the airway pressure (Paw) is off in the IPPV mode.	Switch on the lower alarm limit for the airway pressure (Paw).
BATTERY LOW	The battery voltage of the uninterruptible power supply (UPS) is too low.	Recharge the batteries of the UPS by running Fabius from the mains power supply for four hours.
BATTERY POWERED	Fabius is not connected to mains power supply (Fabius is powered from the batteries (UPS)).	Connect Fabius to mains power supply.
	The mains power supply failed.	Check the mains power supply.
CHECK BATTERY	The backup battery is not functional.	Replace fuse.
		Inform DrägerService.

Fault	Cause	Remedy
CHECK VENTILATOR	The ventilator is not assembled correctly.	Check the diaphragm and close the housing of the patient system. Select standby mode and switch back to IPPV mode.
CONT HIGH PRESS	The APL valve is in the position MAN during IPPV.	Switch APL valve to IPPV/SPONT.
DEVICE TEMP HIGH	The device temperature is too high.	Check for external heat sources. Check the fan.
EX-VALVE LEAKAGE	There is a leak in the expiratory valve.	Check the expiratory valve.
FiO_2 HIGH	The O_2 flush is in use, the fraction of inspired O_2 exceeds the upper alarm limit.	Check the O_2 setting on the flowmeter block. Check the concentration setting on the anesthetic vaporizer.
FiO_2 INOP	The O_2 sensor has not been calibrated correctly. The O_2 sensor has been replaced but not calibrated. Spent O_2 sensor. Faulty O_2 sensor cable.	Calibrate the O_2 sensor. Calibrate the O_2 sensor. Replace the O_2 sensor and calibrate it. Replace the O_2 sensor cable and calibrate the O_2 sensor.
FiO_2 LIMIT < 21%	The lower limit FiO_2 is between 18% and 20%.	Set appropriate FiO_2 lower limit.
FiO_2 LOW	The FiO_2 is below the lower alarm limit.	Check the O_2 supply. Check settings on flowmeter block.
FLOW INOP	The flow sensor has not been calibrated. The flow sensor is faulty. The flow sensor has been replaced but not calibrated. The flow sensor hose is faulty.	Calibrate the flow sensor. Replace the flow sensor and calibrate it. Calibrate the flow sensor. Replace the flow sensor hose and calibrate the flow sensor.

Fault	Cause	Remedy
MEMORY ERROR	Internal data loss.	Switch Fabius off and on. Inform DrägerService, if necessary.
MV HIGH	The upper alarm limit for the minute volume has been exceeded.	Calibrate the flow sensor (see Instructions for Use).
	The flow sensor has not been calibrated.	Calibrate the flow sensor.
	The flow sensor is faulty.	Replace with new flow sensor and calibrate new flow sensor.
MV LOW	The minute volume has decreased below the lower alarm limit.	Check the minute volume.
	The hose is blocked/kinked.	Check the hose system.
	There is a leak in the breathing system.	Check the breathing system.
	Reduced volume during pressure limitation.	Leak test the breathing system.
	Reduced lung compliance.	Adjust the ventilation parameters correctly.
	The flow sensor has not been calibrated.	Calibrate the flow sensor.
	The flow sensor is faulty.	Replace with new flow sensor and calibrate new flow sensor.
Paw HIGH	The upper alarm limit (Paw) has been exceeded.	Check the upper alarm limit (Paw) setting.
	The hose is kinked.	Check the hose system.
	The upper alarm limit (Paw) has been set too high.	Correct the upper alarm limit (Pmax) setting.
Paw NEGATIVE	Insufficient fresh-gas supply.	Increase the fresh-gas flow.
POWER SUPPLY INOP	Power supply is fault.	Inform DrägerService.
PRESSURE INOP	Faulty pressure sensor.	Inform DrägerService.
PRESSURE LIMIT	Set tidal volume has not been delivered completely.	Increase Pmax value. Decrease V_T value.

Fault	Cause	Remedy
SET APL TO IPPV	The APL valve is switched to MAN in the IPPV mode.	Switch the APL valve to SPONT/IPPV.
SETTINGS LOST	The set parameters or calibration values have been lost.	Check the set parameters or calibration values and correct, if necessary.
VENTILATOR INOP	Internal machine fault. IPPV mode is not operational.	Switch Fabius off and on. Inform DrägerService.
VOL ALARM OFF	The lower alarm limit for MV is off in the IPPV mode.	Set the appropriate lower alarm limit for MV.

Changes

1 Type of Changes

This service manual reflects the state of technology which applied in June 1998.

Type of Change	Date
Spare Parts list new	11.98
Function Description with „Cosy“ new	02.99
Spare Parts list „Cosy“ new	03.99
Test list new	11.99

Appendix

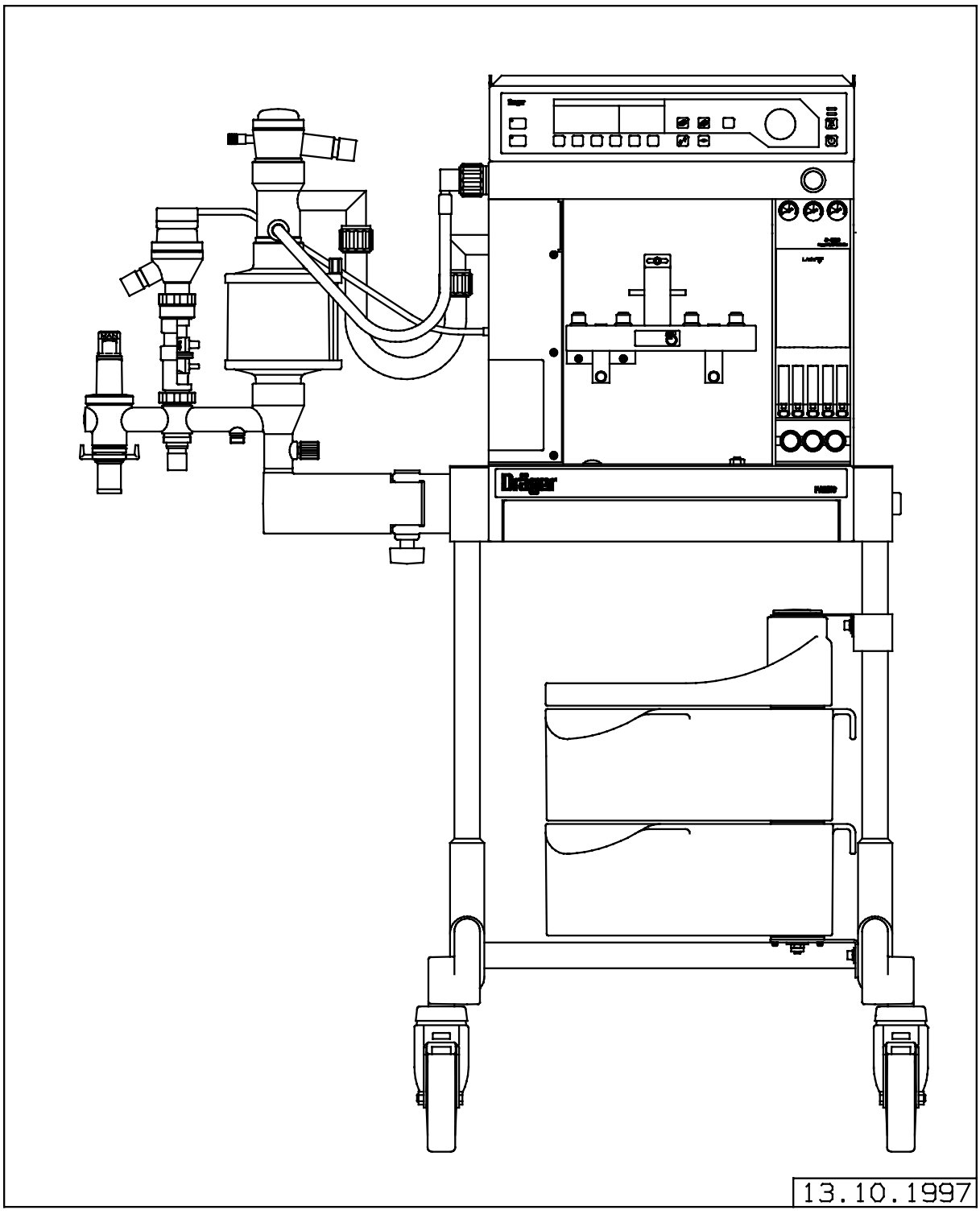
1 Abbreviations

Abbreviations	Meaning/Explanation
ATPS	Ambient Temperature Pressure Saturated
EMC	Electromagnetic Compatibility
f	(Ventilation) Frequency
IPPV	Intermittent Positive Pressure Ventilation
FiO_2	Fraction of Inspired Oxygen (Inspiratory Oxygen Concentration)
MV	Minute Volume
Paw	Airway Pressure
Peak	Peak Pressure
PEEP	Positive End-Expiratory Pressure
Pmax	Maximum Pressure (Limit)
Pmean	Mean Pressure
S-ORC	Sensitive Oxygen Ratio Controller
T_I/T_E	Inspiratory to Expiratory Time Ratio
T_{IP}/T_I	Inspiratory Pause Time to Inspiratory Time Ratio
V_E	Expired Ventilation
V_T	Tidal Volume

2 Spare Parts List

2.1 Fabius

2.2 Compact breathing system Cosy


13.10.1997

Diese Ersatzartikelliste gilt für Sachnummer:
This spare parts list is valid for part no.:

Sach-Nr. **Part No.**	**Benennung** **Description**
2601000	FABIUS CE 2GAS FABIUS CE 2-GASES
2603000	FABIUS CE-3-GAS FABIUS CE-3-GASES
2603500	FABIUS-CE-3GAS-US-STANDARD FABIUS CE-3GAS US-STANDARD

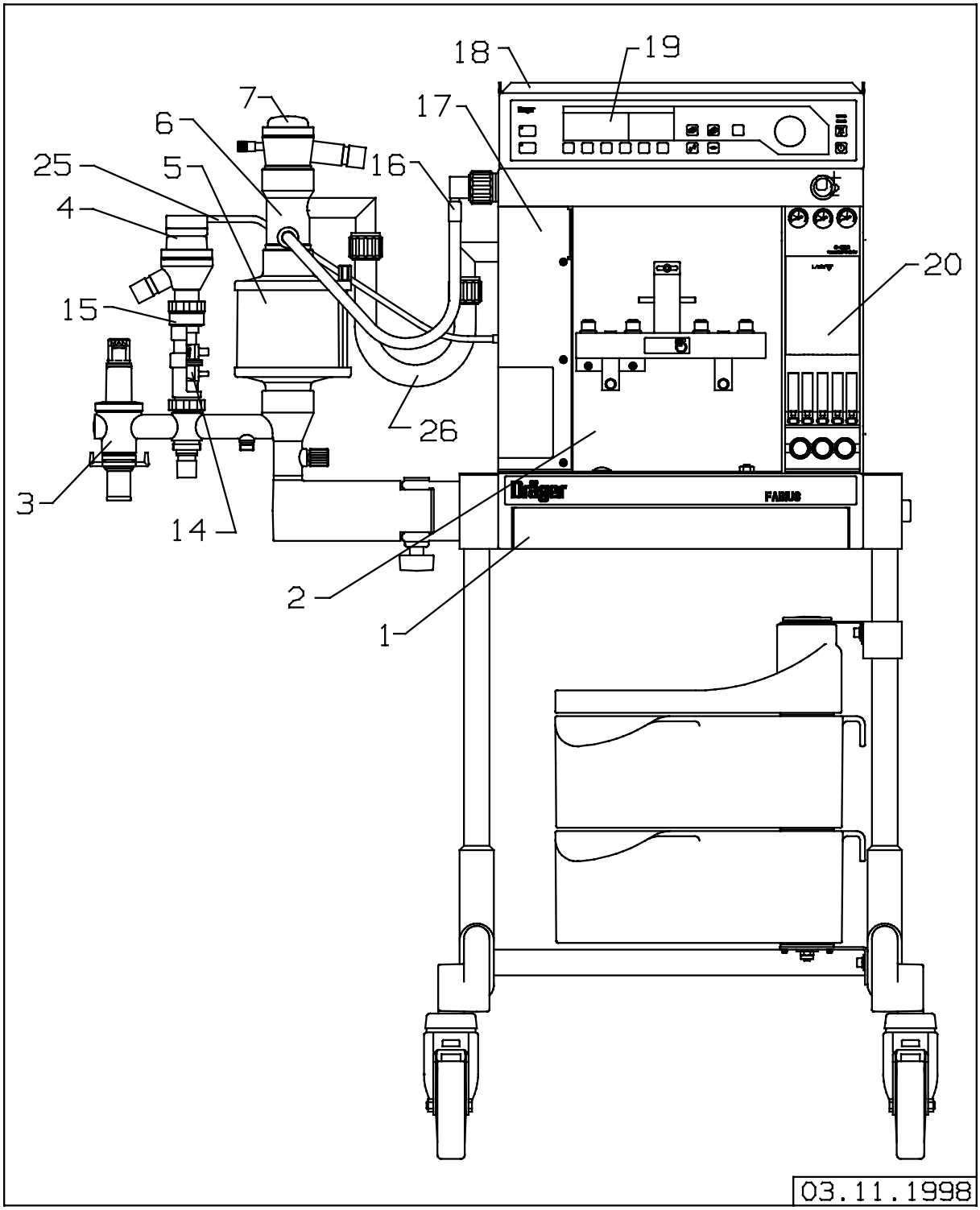
Inhaltsverzeichnis der Bilder
Summary of pictures

Bild Picture	Bezeichnung Description	Sach-Nr. Part No .	E-Liste Spare parts list
1	FABIUS CE 3-GAS FABIUS CE 3-GASES	2603000	
2	FAHRGESTELL TROLLEY	2603200	
3	FAHRGESTELL TROLLEY	2603200	
4	GASBOX GASBOX	2603010	
5	GASBOX GASBOX	2603010	
6	FLOWMETER (3-GAS) FLOWMETER (3-GASES)	2603012	
7	FLOWMETER (3-GAS) FLOWMETER (3-GASES)	2603012	
8	ZWEIGASEINGANG TWO GAS INLET FIXING	2603015	
9	KREISSYSTEMTRÄGER 9 CIRCUIT SYSTEM SUPPORT 9	2600110	
10	INSPIRATIONSVENTIL INSPIRATORY VALVE	2600120	
11	EXSPIRATIONSVENTIL EXPIRATORY VALVE	2600140	
12	ABSORBER ABSORBER	2600180	
13	ZWISCHENSTÜCK ML INTERMEDIATE PIECE-ML	2600160	
14	KONTROLLBOX FÜR FABIUS CONTROL BOX FABIUS	2600350	
15	VENTILATOR FÜR FABIUS VENTILATOR FABIUS	2600600	
16	VENTILATOR FÜR FABIUS VENTILATOR FABIUS	2600600	
17	PNEUMATISCHE STEUERUNG PNEUMATIC CONTROL	2600550	
18	FLOWMETER (3-GAS, US-STANDARD) FLOWMETER (3-GAS, US-STANDARD)	2603504	
19	FLOWMETER (3-GAS, US-STANDARD) FLOWMETER (3-GAS, US-STANDARD)	2603504	

Bild **Picture**	**Bezeichnung** **Description**	**Sach-Nr.** **Part No .**	**E-Liste** **Spare parts list**
20	FLOWMETER (2-GAS) FLOWMETER (2-GASES)	2600332	
21	FLOWMETER (2-GAS) FLOWMETER (2-GASES)	2600332	
22	FLASCHEN RUESTSATZ 4XPIN INDEX CYLINDER REPLACEM.4XPIN INDEX	2600420	
23	FLASCHEN RUESTSATZ 4XPIN INDEX CYLINDER REPLACEM.4XPIN INDEX	2600420	
24	SCHLAUCH FLASCHENVERSORGUNG N2O HOSE CYLINDER SUPPLY N2O	2600421	
25	SCHLAUCH FLASCHENVERSORGUNG O2 HOSE CYLINDER SUPPLY O2	2600422	
26	FLASCHENSPANNBÜGEL O2 CYLINDER CLAMP O2	M28987	

FABIUS CE 3-GAS
FABIUS CE 3-GASES

Bild/Picture 1



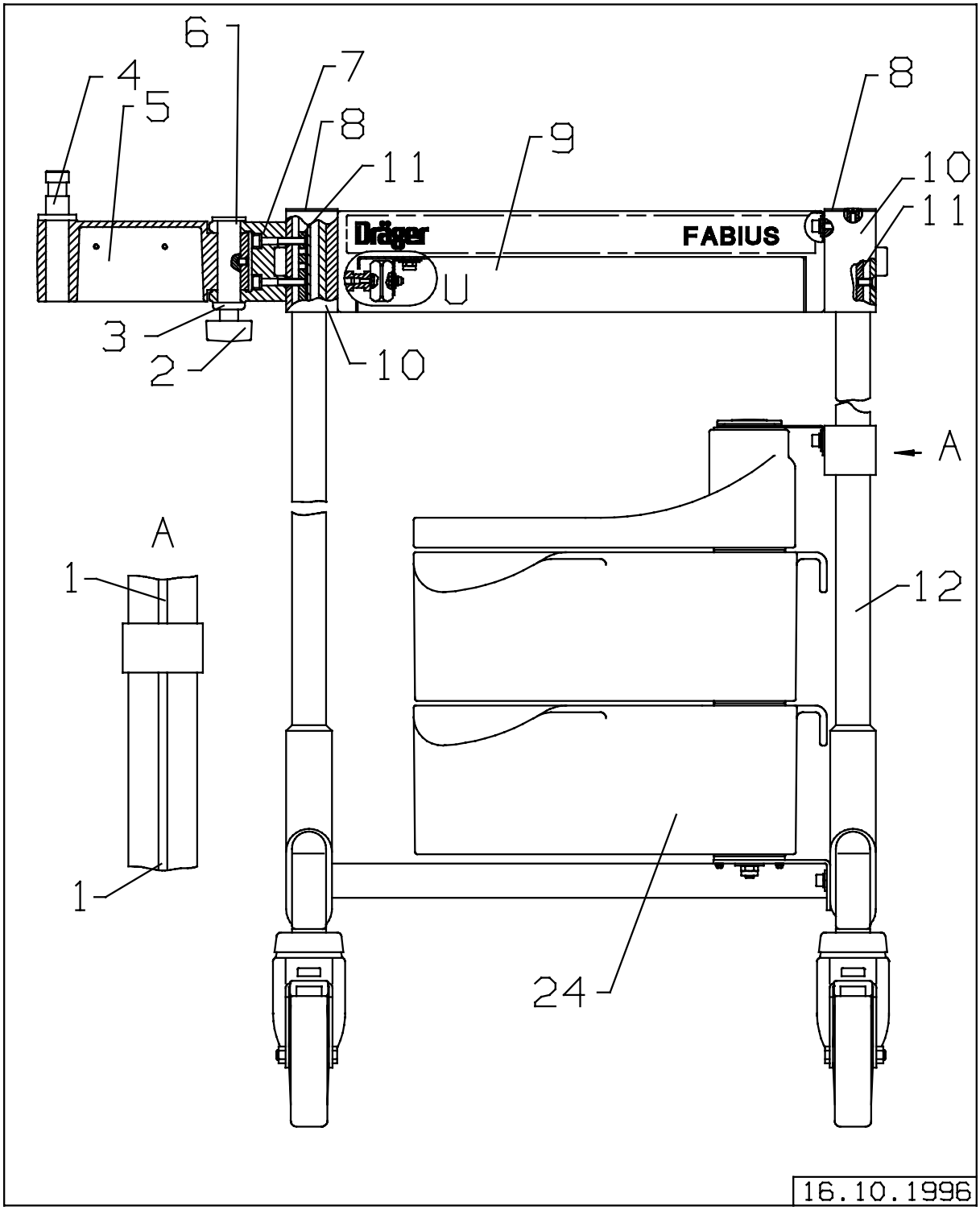
Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-26	FABIUS CE-3-GAS FABIUS CE-3-GASES		2603000	
	FABIUS-CE-3GAS-US-STANDARD Pos. Nr. 1, 2a, 3-19, 20a, 21a, 22-24 FABIUS CE-3GAS US-STANDARD item no. 1, 2a, 3-19, 20a, 21a, 22-24		2603500	
	FABIUS CE 2GAS Pos. Nr. 1, 2b, 3-19, 20b, 21b, 22-24 FABIUS CE 2-GASES item no. 1, 2b, 3-19, 20b, 21b, 22-24		2601000	
1	FAHRGESTELL,KOMPL. TROLLEY-CE	2603200		
2	GASBOX 3-GAS (S-ORC) 3-GAS S-ORC		2603010	
2a	GASBOX 3-GAS US GASBOX (3-GASES, US-STANDARD)	2603502		
2b	GASBOX 2-GAS (S-ORC) 2-GAS S-ORC		2600500	
3-13	KREISSYSTEM ML CIRCUIT SYSTEM ML	2600100		
3	KREISSYSTEMTRAEGER 9 CIRCUIT SYSTEM SUPPORT 9		2600110	
4	EXSPIRATIONSVENTIL ML EXPIRATION VALVE		2600140	
5	ABSORBER ABSORBER	2600180		
6	ZWISCHENSTUECK ML ADAPTER ML		2600160	
7	INSPIRATIONSVENTIL INSPIRATORY VALVE	2600120		
8	ATEMSCHLAUCH E 60CM ohne Abbildung BREATHING HOSE E 60CM without illustration		2165627	
9	ATEMSCHLAUCH E 110CM ohne Abbildung BREATHING HOSE E 110CM without illustration		2165635	
10	ATEMBEUTEL 2,3L ISO ohne Abbildung BREATHING BAG 2,3L without illustration		2165708	

Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
11	WASSERFALLE ohne Abbildung WATER SEPARATOR without illustration		8404985	
12	EINFUELLTRICHTER ohne Abbildung FUNNEL TUBE without illustration		M07700	
13	DOPPELTUELLE 22/22 ohne Abbildung NOZZLE 22/22 without illustration		M25647	
14	FLOWSENSOR FLOWSENSOR		8412034	
14	MESSLEITUNG FUER FLOWSENSOR ohne Abbildung MEASURING LINE F. FLOW SENSOR without illustration		8410929	
14	O2-SENSORGEHAEUSE (OXIDIG) ohne Abbildung SENSOR HOUSING OXYDIG without illustration		6850250	
14	STECKADAPTER*F.O2-SENSOR* ohne Abbildung PLUG ADAPTOR F.O2-SENSOR without illustration		M27964	
14	DRUCKMESSLEITUNG ohne Abbildung PRESSURE GAUGE LINE without illustration		8302841	
14	BAKTERIENFILTER ohne Abbildung BACTERIA FILTER without illustration		8402868	
14	KUPPLUNG M.ATEMGAS ohne Abbildung COUPLING M without illustration		M26239	
14	SCHLAUCH 4X1,5-SI 50 SH A NF ohne Abbildung HOSE 4X1,5-SI 50 SH A NF without illustration		1190520	
15	FLOWSENSOR Halter FLOWSENSOR, SUPPORT	2600690		

Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
16	FRISCHGASSCHLAUCH ISO COMMON GAS HOSE ISO	2600170		
16	FRISCHGASSCHLAUCH 0,7M COMMON GAS HOSE 0,7M		M29217	
17	VENTILATOR,VOLLST. VENTILATOR COMPL.		2600600	
18	ABLAGEPLATTE TOP PLATE GROUP	2600190		
19	CONTROL BOX 220V CONTROL BOX 220V	2600350		
20	FLOWMETER FLOWMETER	2600331		
20a	FLOWMETER 3 GAS US-O2,N2O,AIR FLOWMETER 3 GAS US-O2,N2O,AIR	2603504		
20b	FLOWMETER 2 GAS EURO-O2,N2O FLOWMETER 2 GAS EURO-O2,N2O	2600332		
21	ZWEIGASEINGANG ohne Abbildung TWO GAS INLET FIXING without illustration	2600575		
21a	3 GASE 5 EINGAENGE 3 GAS INLET 5 CONNECTORS	2603015		
21b	2 GASE 4 EINGAENGE 2 GAS INLET 4 CONNECTORS	2601002		
22	PNEUMATISCHE STEUERUNG ohne Abbildung PNEUMATIC CONTROL without illustration	2600550		
23	Y-STUECK ERW.,GERADE ohne Abbildung Y-PIECE ADULT,STRAIGHT without illustration		M25650	
24	DICHTRING ohne Abbildung PACKING RING without illustration		M05128	
25	SCHLAUCH 2X1,5 SI NF 8403323 HOSE 2X1,5 SI NF 8403323		1203622	
26	SCHLAUCH 2-0,7M, LIVIUS SD HOSE 2-0,7M, LIVIUS SD		M32701	

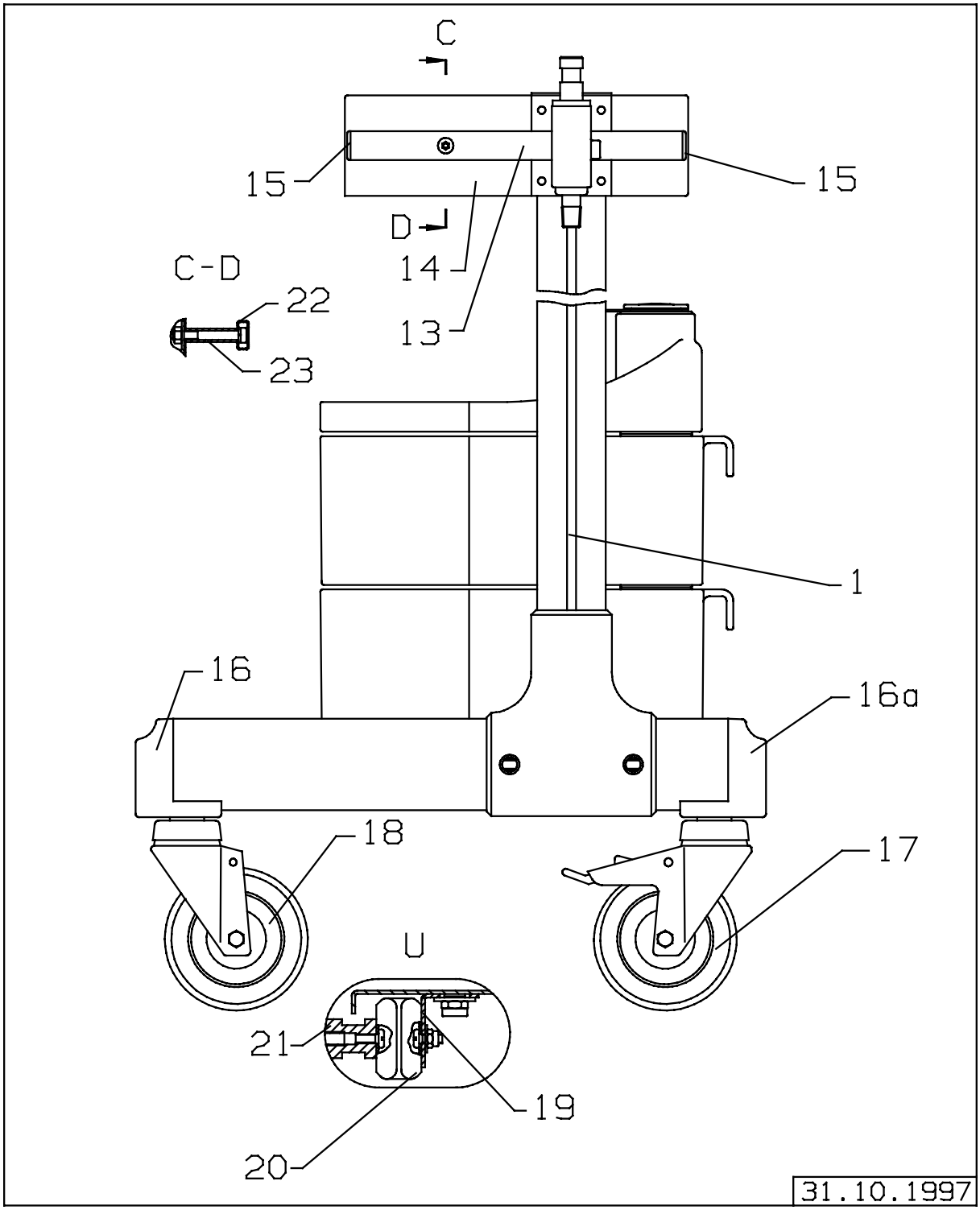
FAHRGESTELL
TROLLEY

Bild/Picture 2



FAHRGESTELL
TROLLEY

Bild/Picture 3

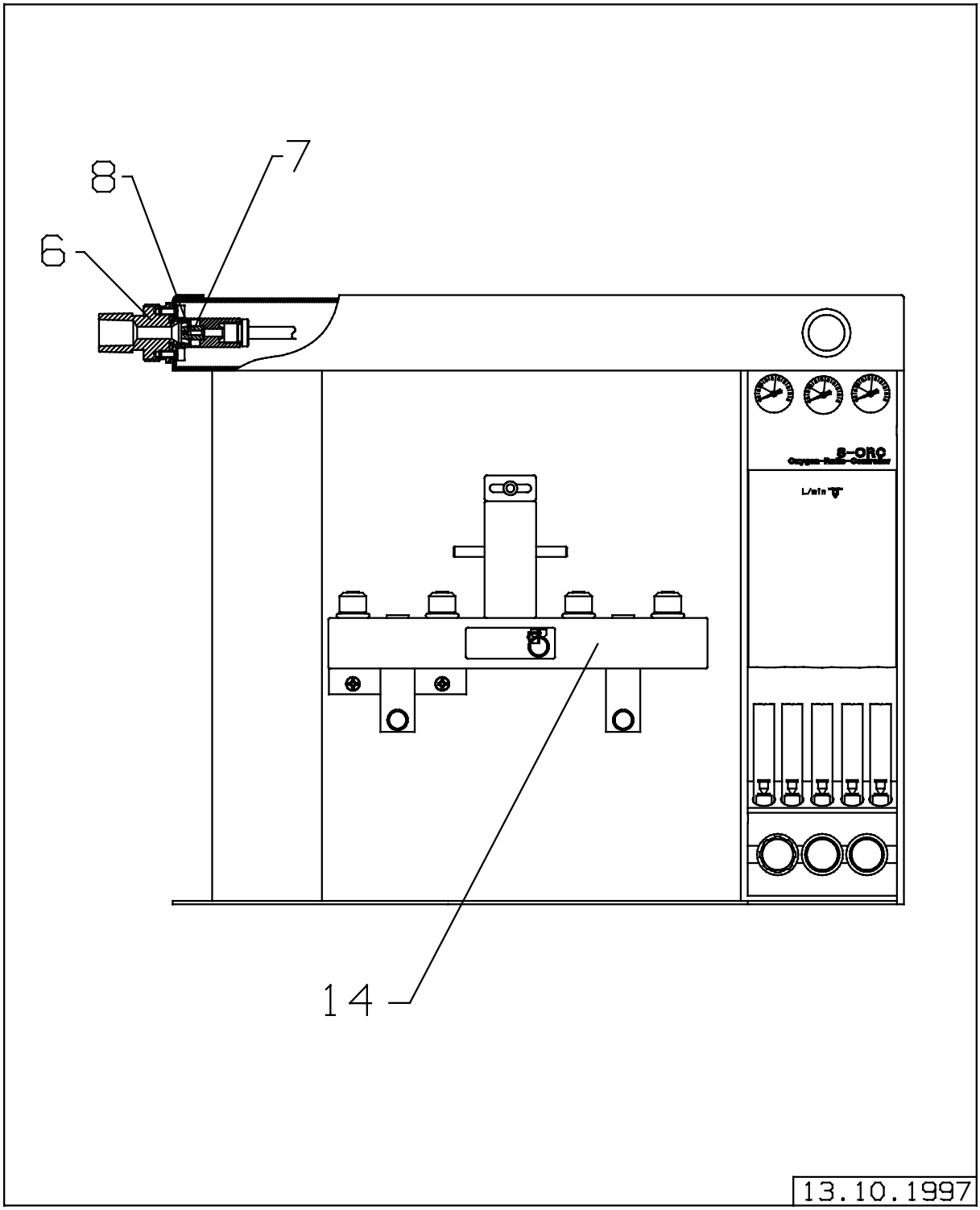


Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-24	FAHRGESTELL,KOMPL. TROLLEY-CE	2603200		
1	PROFIL PROFILE		M29336	
2	KNEBELSCHRAUBE HANDLE OF LOCKING SCREW	2600230		
3	SCHEIBE LOCKING PLATE	2600227		
4	GELENKBOLZEN HINGED BOLT	2600221		
5	GELENKARM HINGE ARM	2600226		
6	BOLZEN,VOLLST. SHAFT OF HINGE ARM GROUP	2600223		
7	GELENKARMHALTER HOLDER OF HINGE ARM	2600229		
8	PLATTE PLATE	2600246		
9	SCHREIBPLATTE WRITING PLATE	2600250		
10	HALTER CLIP	2600248		
11	PLATTE PLATE	2600201		
12	SCHRANK DRAWERS	2600260		
13	SCHIENE LEFT RAIL	2600238		
14	BLECH TABLE	2600240		
15	VERSCHLUSS-STOPFEN VENT PLUG		G60455	
16	LAUFROLLENHALTER RECHTS WHEEL HOLDER, RIGHT	2600258		
16a	LAUFROLLENHALTER LINKS WHEEL HOLDER, LEFT	2600259		
17	LAUFROLLE M.FESTSTELLER CASTOR WITH FIXING		M34523	
18	LAUFROLLE CASTOR		M34524	

Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
19	WINKEL SQUARE BAR	2600252		
20	TELESKOPSCHIENE TELESCOPE RAIL		2M18364	
21	DISTANZSTUECK DRAWER STAND	2600251		
22	SCHIENE RIGHT RAIL	2600244		
23	ROHR RING IN RIGHT RAIL	2600239		
24	SCHWENKSCHRANK,VOLLST. SWIVEL CUPBOARD, CPL.		2M20638	

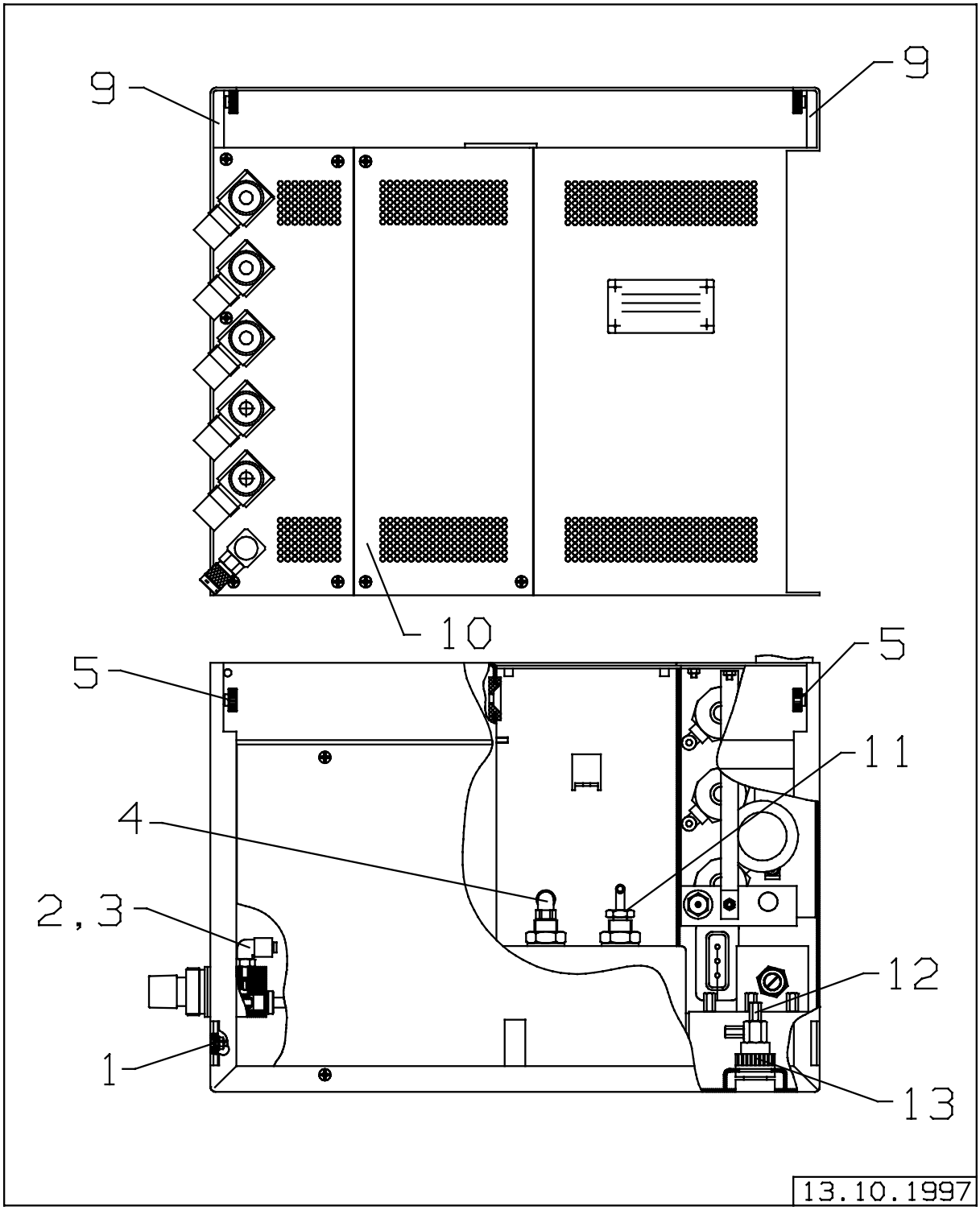
GASBOX
GASBOX

Bild/Picture 4



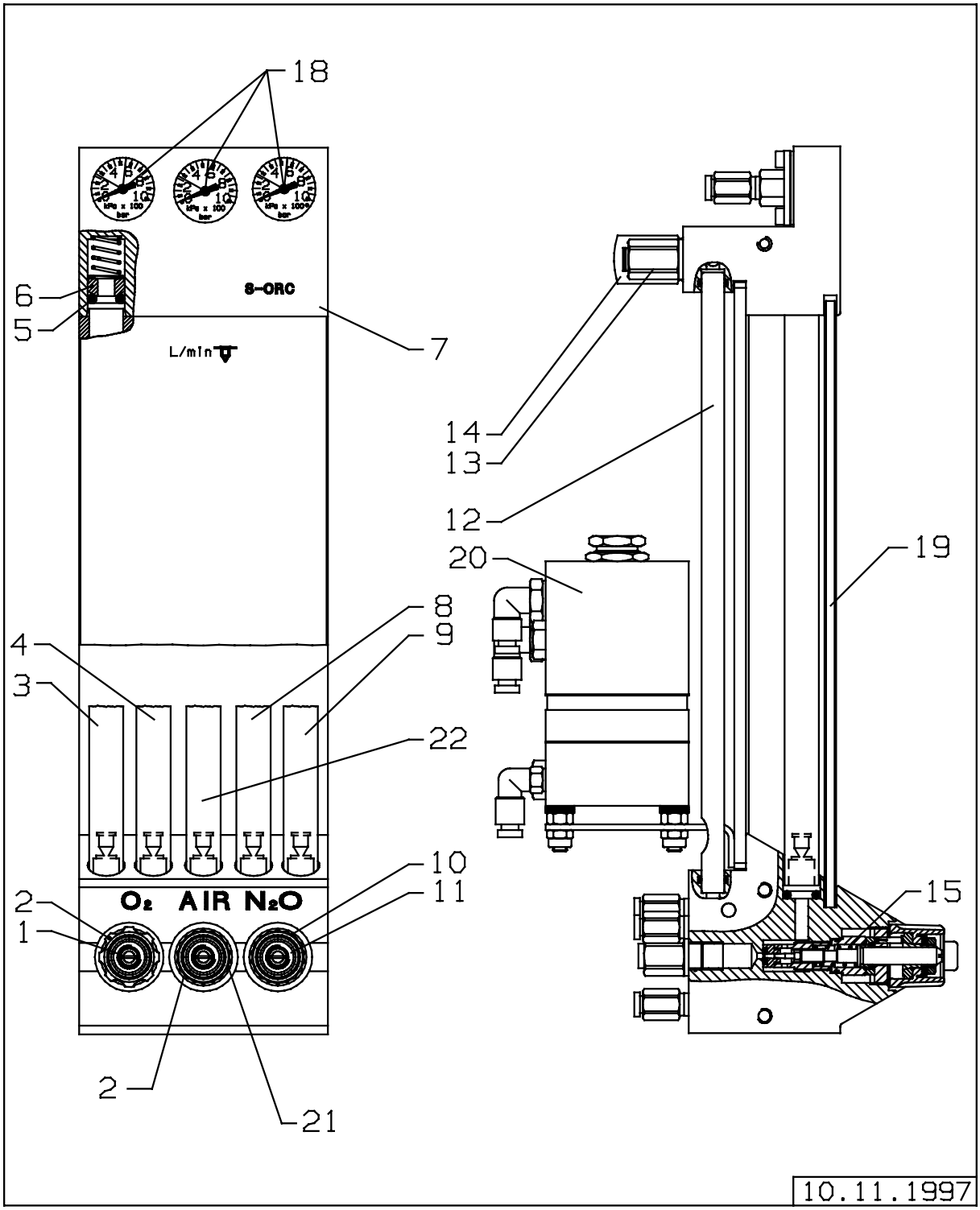
GASBOX
GASBOX

Bild/Picture 5

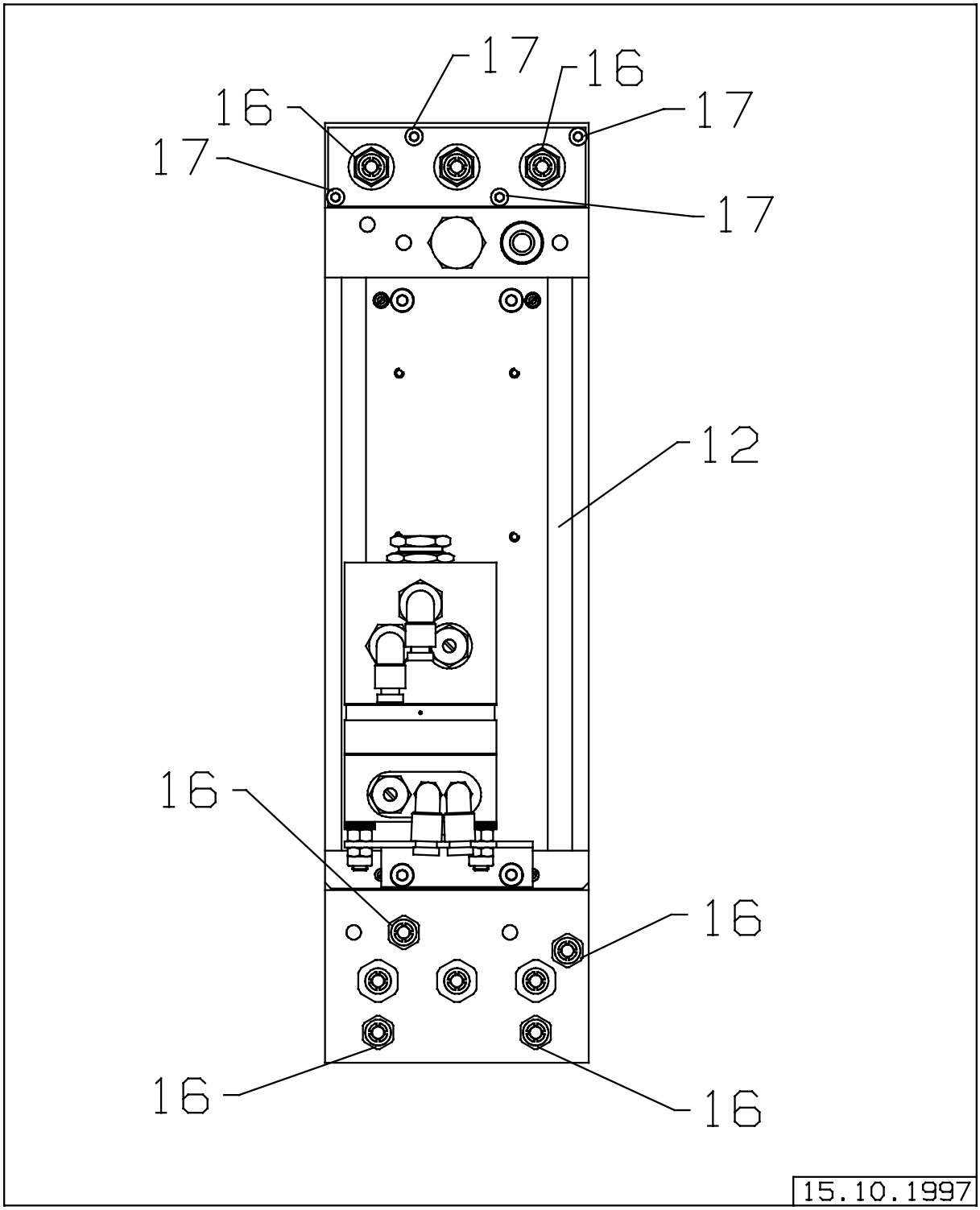


Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-14	GASBOX 3-GAS (S-ORC) 3-GAS S-ORC		2603010	
1-14	GASBOX 3-GAS US GASBOX (3-GASES, US-STANDARD)	2603502		
1-14	GASBOX 2-GAS (S-ORC) 2-GAS S-ORC		2600500	
1	KLINKE HOLDER	2600541		
2	WINKELSTECKANSCHLUSS ANGLE CONNECTION		M30935	
3	DRUCKRING 4 MM,WEISS THRUST COLLAR 4, WHITE		M31602	
4	WINKELSTECKANSCHLUSS ANGLE CONNECTION		M30961	
5	BOLT/SCHRAUBE BOLT	2600504		
6	MISCHGASKONUS MIX GAS CONE CONNECTOR	2600501		
7	ANSCHLUSS-STUECK CONNECTOR LUMP	2600503		
8	DRUCKDUESE PRESSURE NOZZLE	2600502		
9	PLATTE BACKSIDE FIX PLATE	2600525		
10	BLECH BACK DOOR	2600505		
11	FRISCHGASROHR VALVE TO MIX GAS PIPE	2600590		
12	STECKANSCHLUSS PLUG-TYPE CONNECTION		M30952	
13	2/2 WEGE-VENTIL 2/2-PORT DISTRIBUTING VALVE		M31774	
14	VAPORHALTER PILOT BLOCK 2-VAPOR COMPONENT	2600080		

FLOWMETER (3-GAS) **Bild/Picture 6**
FLOWMETER (3-GASES)



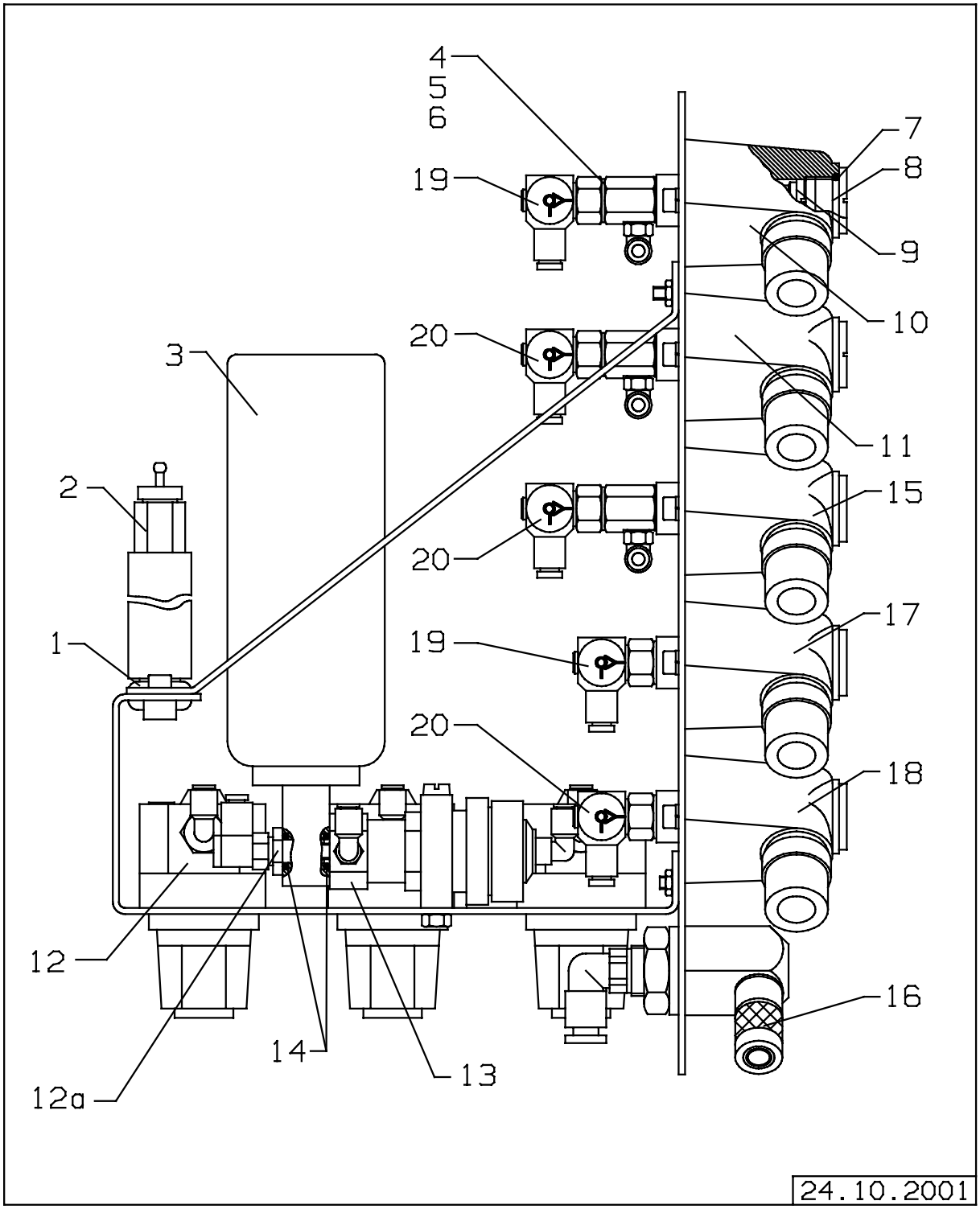
FLOWMETER (3-GAS) **Bild/Picture 7**
FLOWMETER (3-GASES)



Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-22	FLOWMETER 3GAS EURO-O2,N2O,AIR FLOWMETER 3GAS EURO-O2,N2O,AIR	2603012		
1	KAPPE,WEISS CAP,WHITE		M25146	
2	DREHKNOPF A1 OHNE KAPPE KNOB ISO, NOT CAP	2600304		
2	DREHKNOPF A1,OHNE KAPPE CONTROL KNOB A 1 WITHOUT CAP		M25149	
3	MESSROEHRE FUER O2 METER TUBE FOR O2		M29391	
4	MESSROEHRE FUER O2 METER TUBE FOR O2		M29392	
5	O-RING O-RING SEAL		M34329	
6	FEDERLAGER HANGER	2600303		
7	ANSCHLUSS-STUECK, (OBEN) CONNECTING PIECE (TOPSIDE)	M33601		
8	MESSROEHRE FUER N2O METER TUBE FOR N2O		M29393	
9	MESSROEHRE FUER N2O METER TUBE FOR N2O		M29394	
10	DREHKNOPF ISO,OHNE KAPPE KNOB A1, NOT CAP	2600309		
10	DREHKNOPF ISO,OHNE KAPPE CONTROL KNOB ISO, WITHOUT CAP		M31954	
11	KAPPE 1,BLAU CAP 1,BLUE		M24901	
12	ROHR TUBULE	2600317		
13	STECKANSCHLUSS PLUG-TYPE CONNECTION		M30960	
14	SICHERHEITSVENTIL SAFETY VALVE	2600310		
14	SICHERHEITSVENTIL SAFETY VALVE		M21683	
15	FEINREGELVENTIL-EINBAUSATZ E PRECISION CONTROL VALVE KIT E		M27010	
16	STECKANSCHLUSS PLUG-TYPE CONNECTION		M30952	

Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
17	DRUCKRING 4 MM,WEISS THRUST COLLAR 4, WHITE		M31602	
18	MANOMETER PRESSURE GAUGE		M33402	
19	SCHEIBE PANE		M30297	
20	S-ORC RELIEF VALVE		M32940	
21	KAPPE 1,SCHWARZ/WEISS CAP 1,BLACK-WHITE	M26205		
22	MESSROEHRE FUER AIR METER TUBE FOR AIR		M27292	

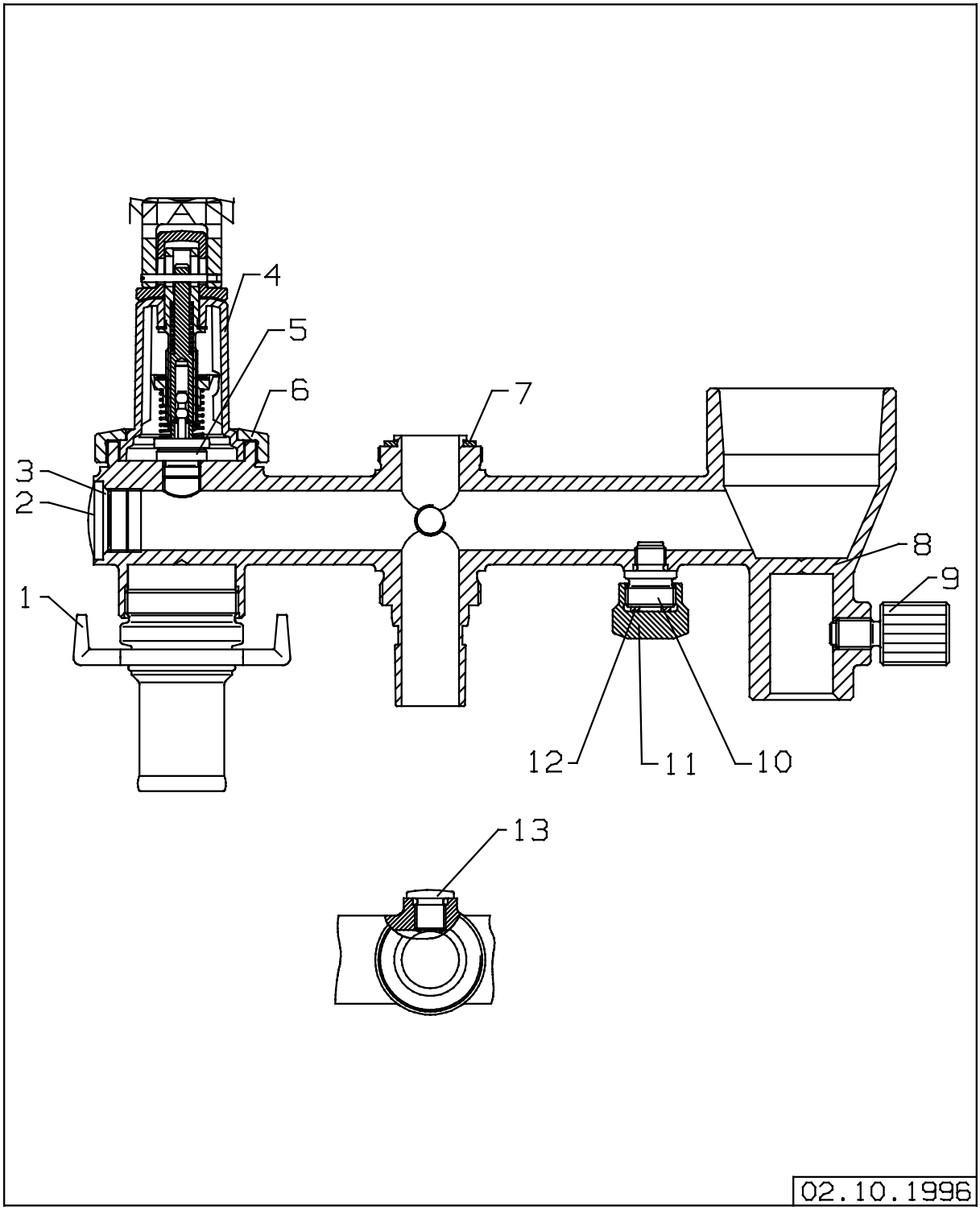
ZWEIGASEINGANG **Bild/Picture 8**
TWO GAS INLET FIXING



Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-20	3 GASE 5 EINGAENGE 3 GAS INLET 5 CONNECTORS	2603015		
1-14,16-20	2 GASE 4 EINGAENGE 2 GAS INLET 4 CONNECTORS	2601002		
1	STIMMPFEIFE TUNING HAMMER		M25073	
2	INJEKTOR INJECTOR		M25062	
3	BEHAELTER, VOLLST. RECEPTACLE, CPL.		M33582	
4	DICHTRING PACKING RING		M07142	
5	DICHTRING PACKING RING		M07143	
6	DICHTRING PACKING RING		M07144	
7	RUNDSCHNURRING TOROIDAL SEALING RING		M19241	
8	VERSCHLUSS-SCHRAUBE LOCK SCREW	M27731		
9	SIEBEINSATZ MESH BOTTOM		M19238	
10	GEHAEUSE O2 HOUSING O2	M31991		
11	GEHAEUSE N2O HOUSING N2O	M31992		
12	DRUCKREGLER PRESSURE REGULATOR		8402745	
12	E-SET DRUCKREGLER REP.SET PRESSURE REGULATOR		8411129	
12a	SCHRAUBE SCREW		2600584	
13	ALARMVENTIL ALARM VALVE		M28690	
13	ALARMVENTIL ALARM VALVE	2600480		
13	MEMBRAN DIAPHRAGM		M16497	
14	O-RING O-RING SEAL		E20274	

Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
15	GEHAEUSE AIR HOUSING AIR	M31993		
16	KUPPLUNG F,O2 COUPLING O2		M26235	
17	GEHAEUSE O2 HOUSING O2	M32311		
18	GEHAEUSE N2O HOUSING N2O	M32312		
19	RUECKSCHLAG-WINKELANSCHLUSS ANGLED CONNECTION		M30946	
20	RUECKSCHLAG-WINKELANSCHLUSS ANGLED CONNECTION		M30945	

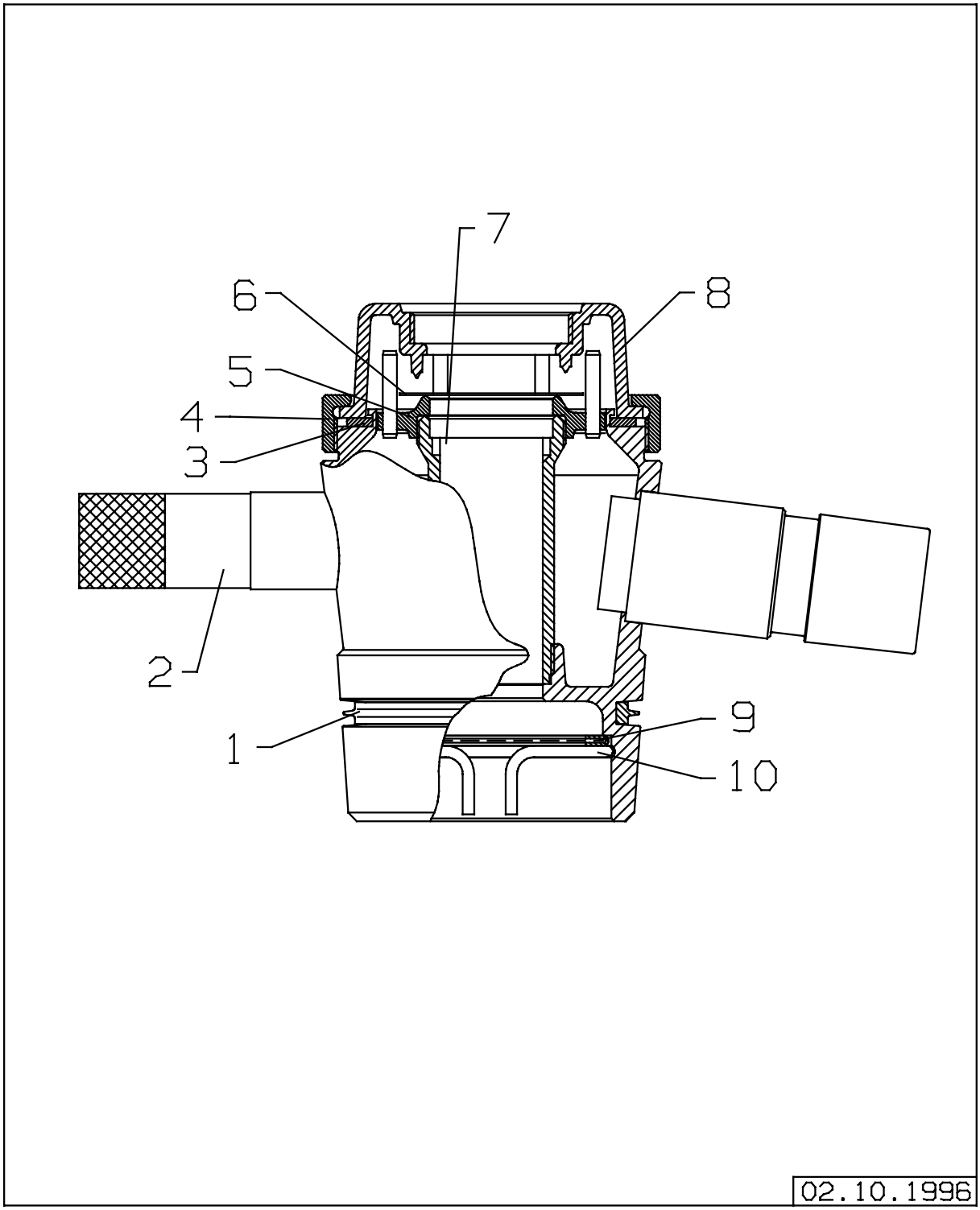
KREISSYSTEMTRÄGER 9 **Bild/Picture 9**
CIRCUIT SYSTEM SUPPORT 9



Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-13	KREISSYSTEMTRAEGER 9 CIRCUIT SYSTEM SUPPORT 9		2600110	
1	RUECKSCHLAGVENTIL NONRETURN VALVE		M32579	
1	HAKENRING HOOK SPRING RING		M17786	
2	VERSCHLUSZSCHRAUBE SCREW PLUG	2600101		
3	O-RING O-RING SEAL		R26807	
4	APL-VENTIL (FABIUS) APL-VALVE (FABIUS)		2600112	
5	KRATERSCHRAUBE CRATER SCREW		M17774	
6	UEBERWURFMUTTER UNION NUT	2600107		
7	DICHTRING PACKING RING		M09257	
8	GEHAEUSE HOUSING	M32576		
9	KLEMMSCHRAUBE SLAMP SCREW	2600102		
10	VERBINDUNGSSTÜCK CONNECTION PIECE	2600104		
11	DICHTMUTTER SEALING NUT	2600108		
12	GUMMISCHEIBE RUBBER GASKET	M14197		
13	VERSCHLUSZSCHRAUBE SMALL PLUG	2600103		

INSPIRATIONSVENTIL
INSPIRATORY VALVE

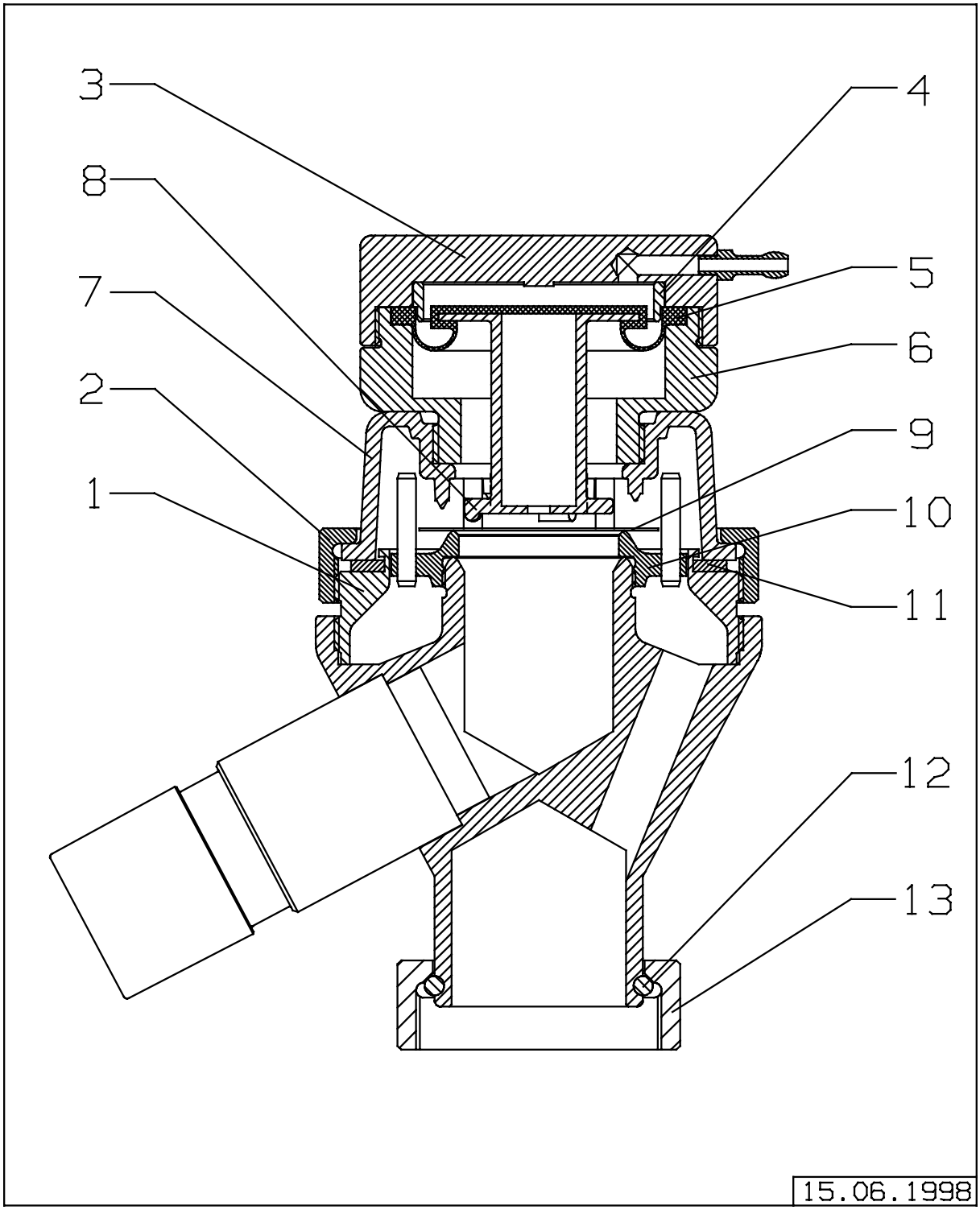
Bild/Picture 10



Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-10	INSPIRATIONSVENTIL INSPIRATORY VALVE	2600120		
1-10	INSPIRATIONSVENTIL INSPIRATION VALVE		M32008	
1	DICHTRING PACKING RING		M32014	
2	KUPPLUNG F.ATEMGAS COUPLING		M26238	
3	DICHTRING PACKING RING		M09231	
4	UEBERWURFMUTTER UNION NUT	2600124		
5	VENTILKRATER VALVE CRATER		M30413	
6	VENTILSCHEIBE VALVE DISK		R00360	10
7	ABSTANDSROHR SPACER	2600127		
8	KAPPE CAP		M21482	
9-10	SATZ SIEBEINSATZ SET OF MESH BOTTOMS		M22156	
9	SIEBEINSATZ *UGR* MESH BOTTOM	M19597		
10	RING LOCKING RING	M19602		

EXSPIRATIONSVENTIL
EXPIRATORY VALVE

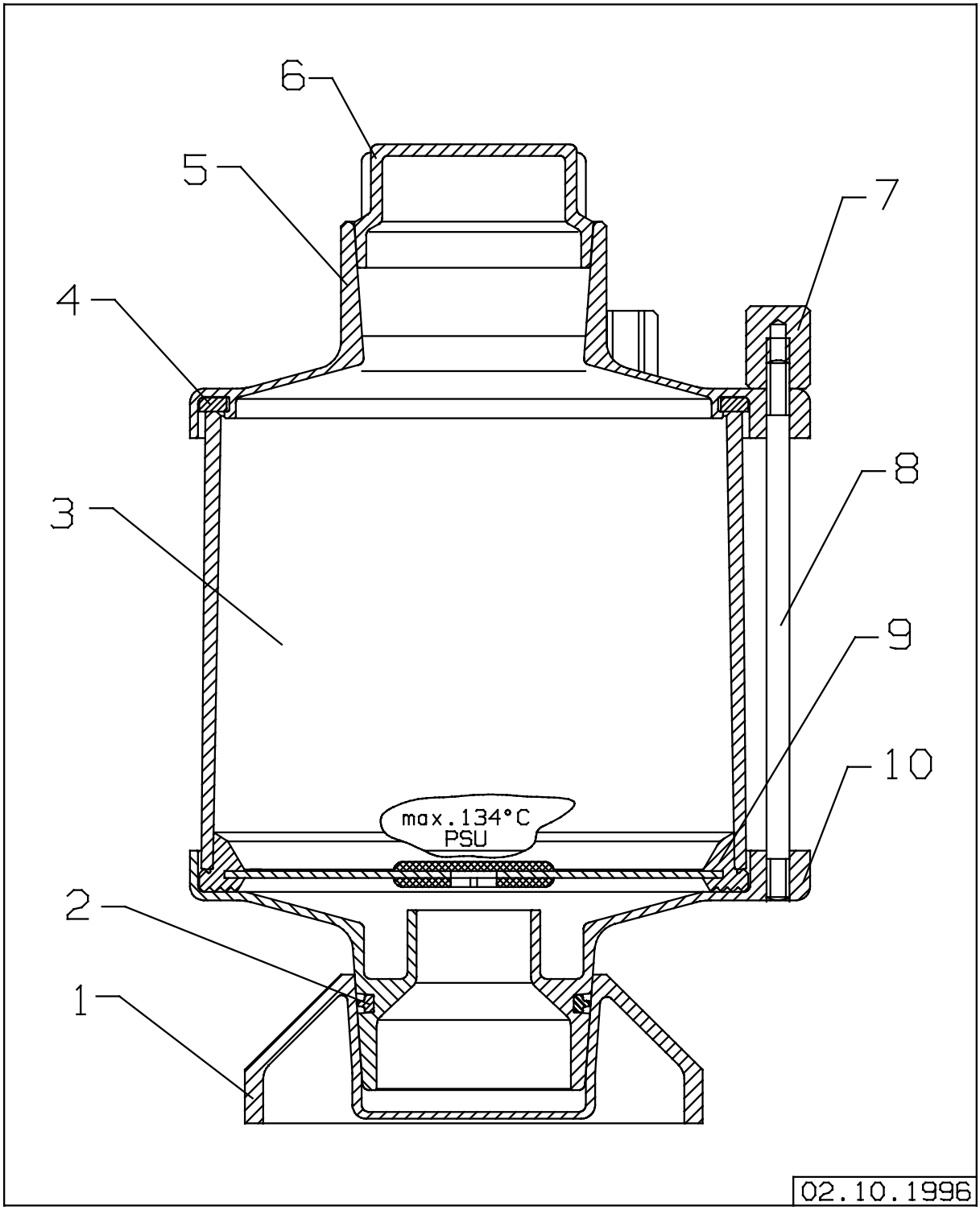
Bild/Picture 11



Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-13	EXSPIRATIONSVENTIL ML EXPIRATION VALVE		2600140	
1	ANSCHLUSZSTUECK UPPER NUT	2600144		
2	UEBERWURFMUTTER UNION NUT		M09228	
3-8	VENTILAUFSATZ LANTERN OF VALVE		2600150	
3	DECKEL LID COMBINATION	2600152		
4	BUCHSE SOCKET	2600155		
5	MEMBRAN DIAPHRAGM		8410181	2
6	MEMBRANAUFNAHME DIAPHRAGM SUPPORT	2600151		
7	KAPPE CAP		M21482	
8	STOESSEL TAPPET	2600156		
9	VENTILSCHEIBE VALVE DISK		R00360	10
10	VENTILKRATER VALVE CRATER		M30413	
11	DICHTRING PACKING RING		M09231	
12	SPRENGRING SPRING RING		M09224	
13	UEBERWURFMUTTER UNION NUT	M09226		

ABSORBER
ABSORBER

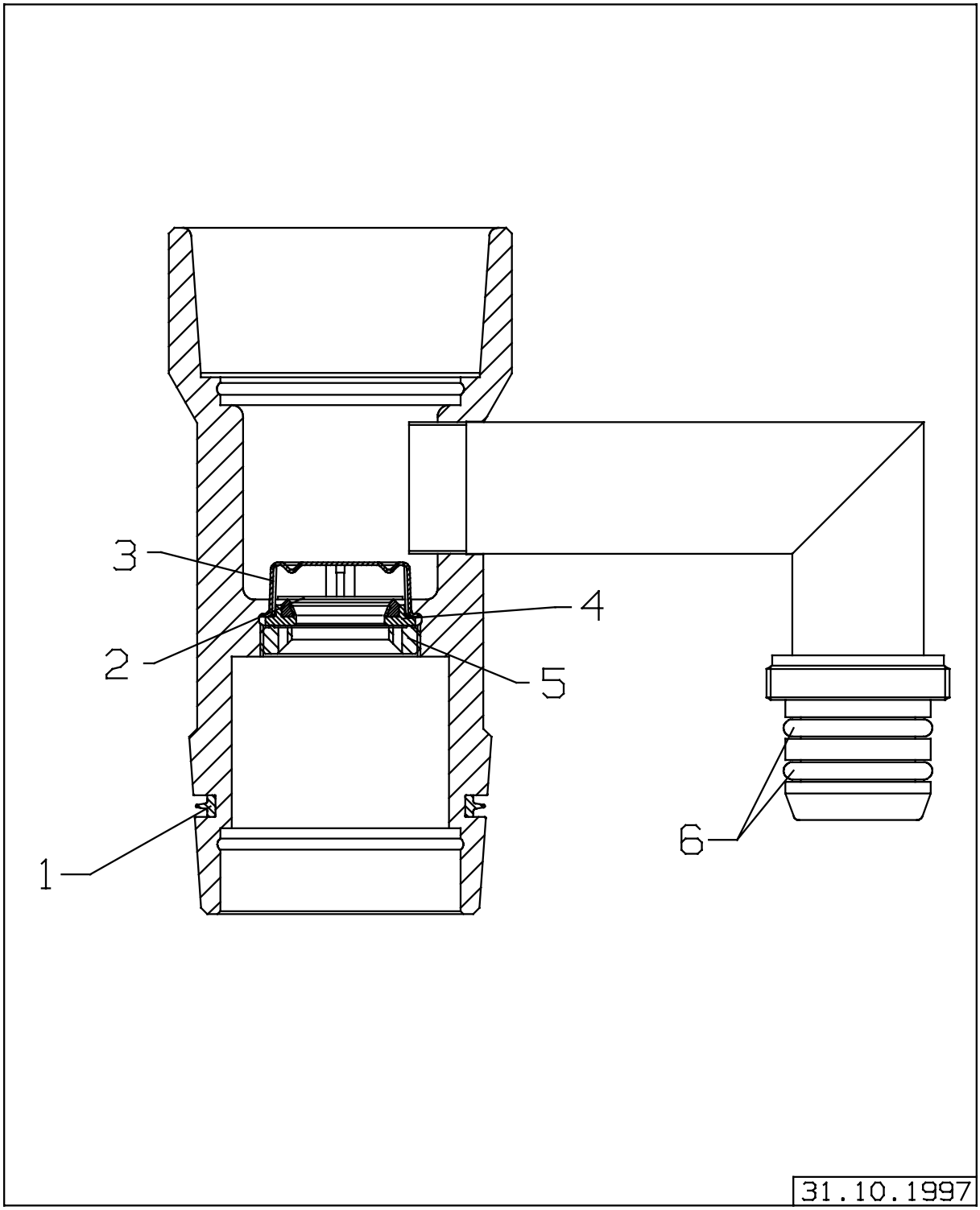
Bild/Picture 12



Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-10	ABSORBER ABSORBER		M32009	
1-10	ABSORBER ABSORBER	2600180		
1+6	SATZ VERSCHLUSSKAPPE SET OF SEALING CAPS		M22160	
1	VERSCHLUSSKAPPE-UNTEN ABSORBER CAP	M14406		
2	DICHTRING PACKING RING		M32014	
3	ABSORBERMANTEL ABSORBER JACKET		M14125	
4	DICHTRING PACKING RING		M13386	
5	DECKEL COVER		M31994	
5	DECKEL COVER	2600188		
6	VERSCHLUSSKAPPE,OBEN ABSORBER CAP	M14405		
7	SPANNMUTTER NUT	2600181		
8	STANGE STUD	2600182		
9	ABSORBERDICHTUNG ABSORBER WASHER		M32028	
10	BODEN BOTTOM		M32327	
10	BODEN BOTTOM	2600185		

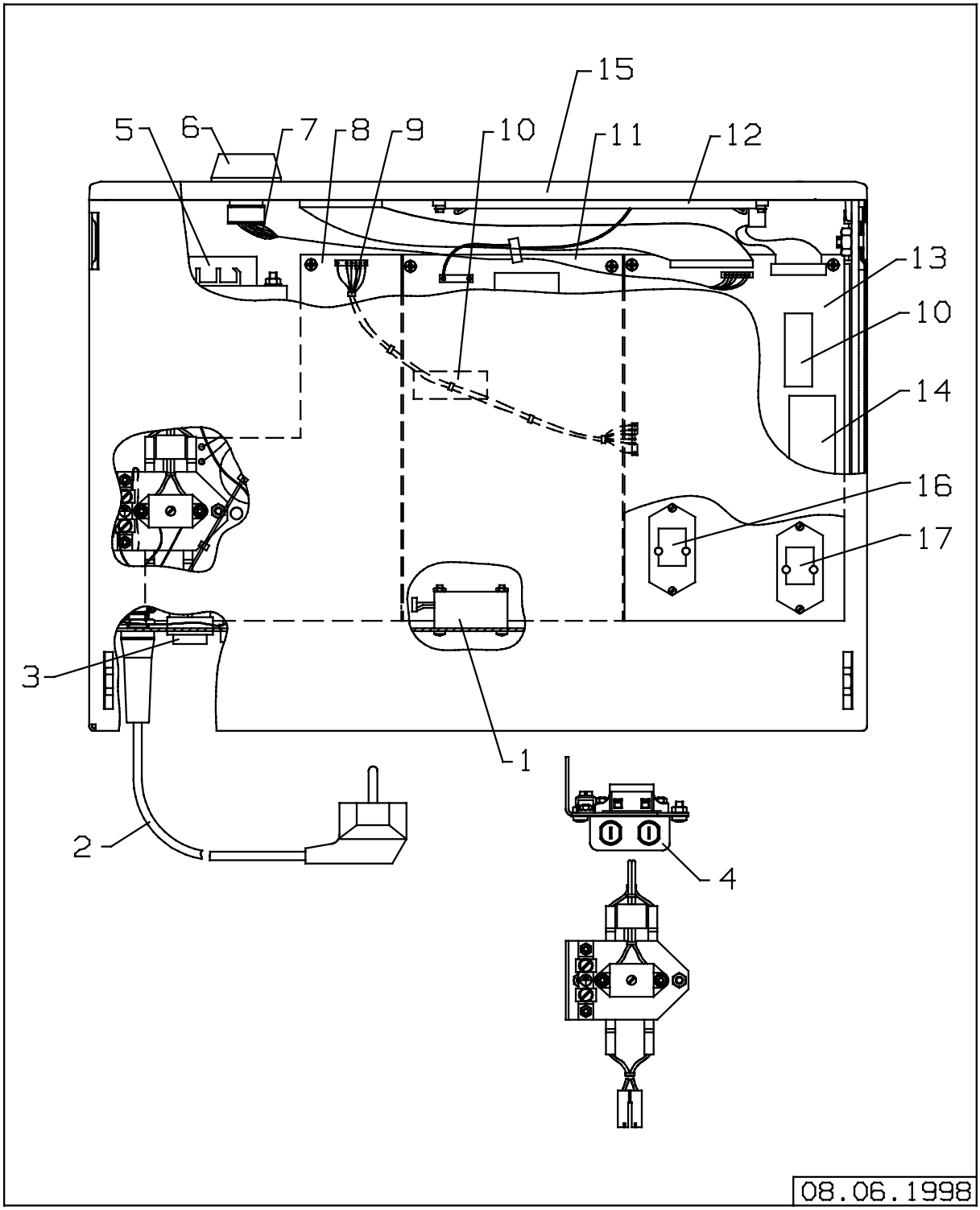
ZWISCHENSTÜCK ML
INTERMEDIATE PIECE-ML

Bild/Picture 13



Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-6	ZWISCHENSTUECK ML ADAPTER ML		2600160	
1	DICHTRING PACKING RING		M32014	
2	VENTILSCHEIBE VALVE REED		M31188	10
3	FEDERKREUZ SPRING CROSS	M17450		
4	KRATER,VOLLST. CRATER, CPL.	M32480		
5	GEWINDERING RING NUT	M32479		
6	RUNDSCHNURRING O-RING SEAL		2M08777	

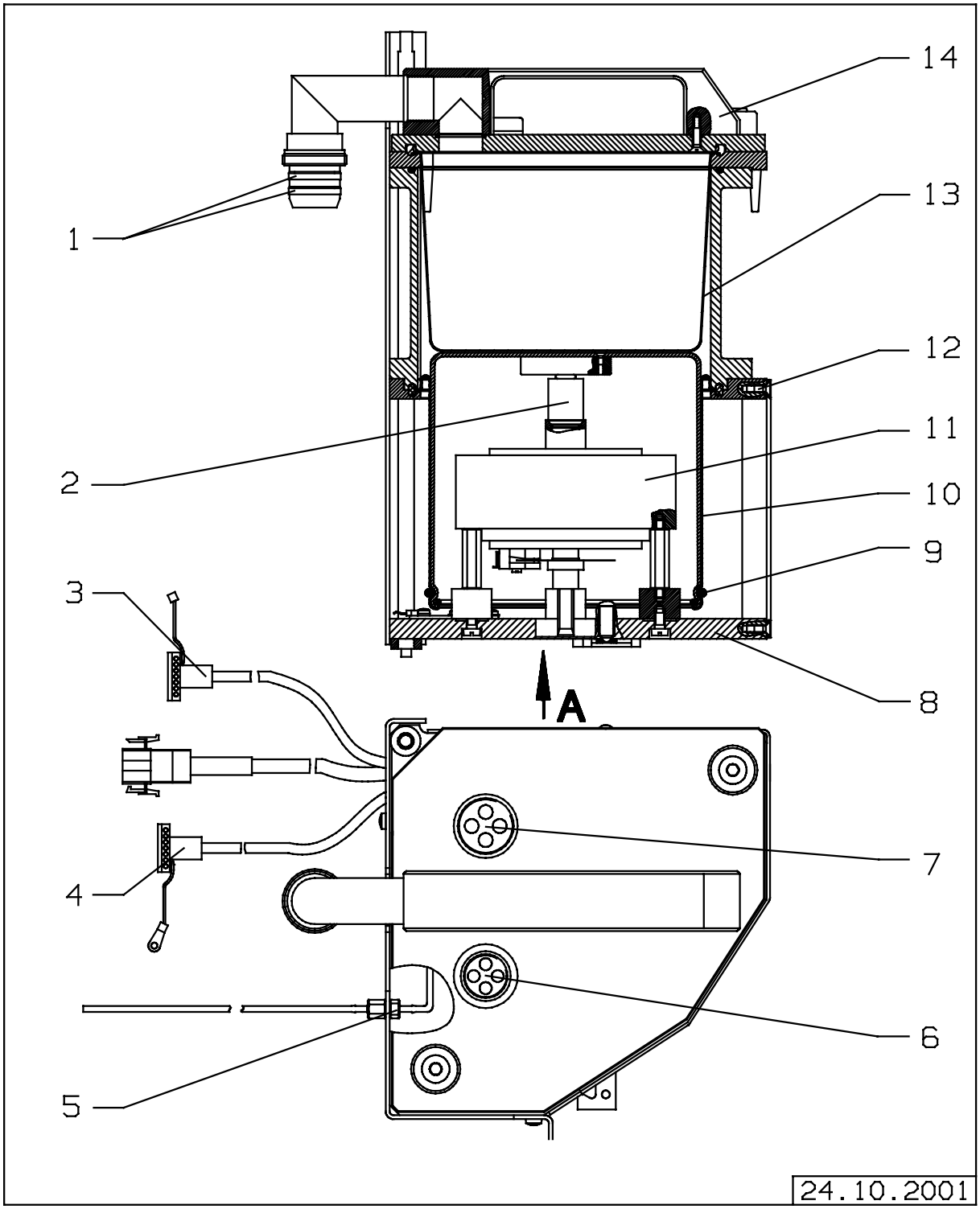
KONTROLLBOX FÜR FABIUS **Bild/Picture 14**
CONTROL BOX FABIUS



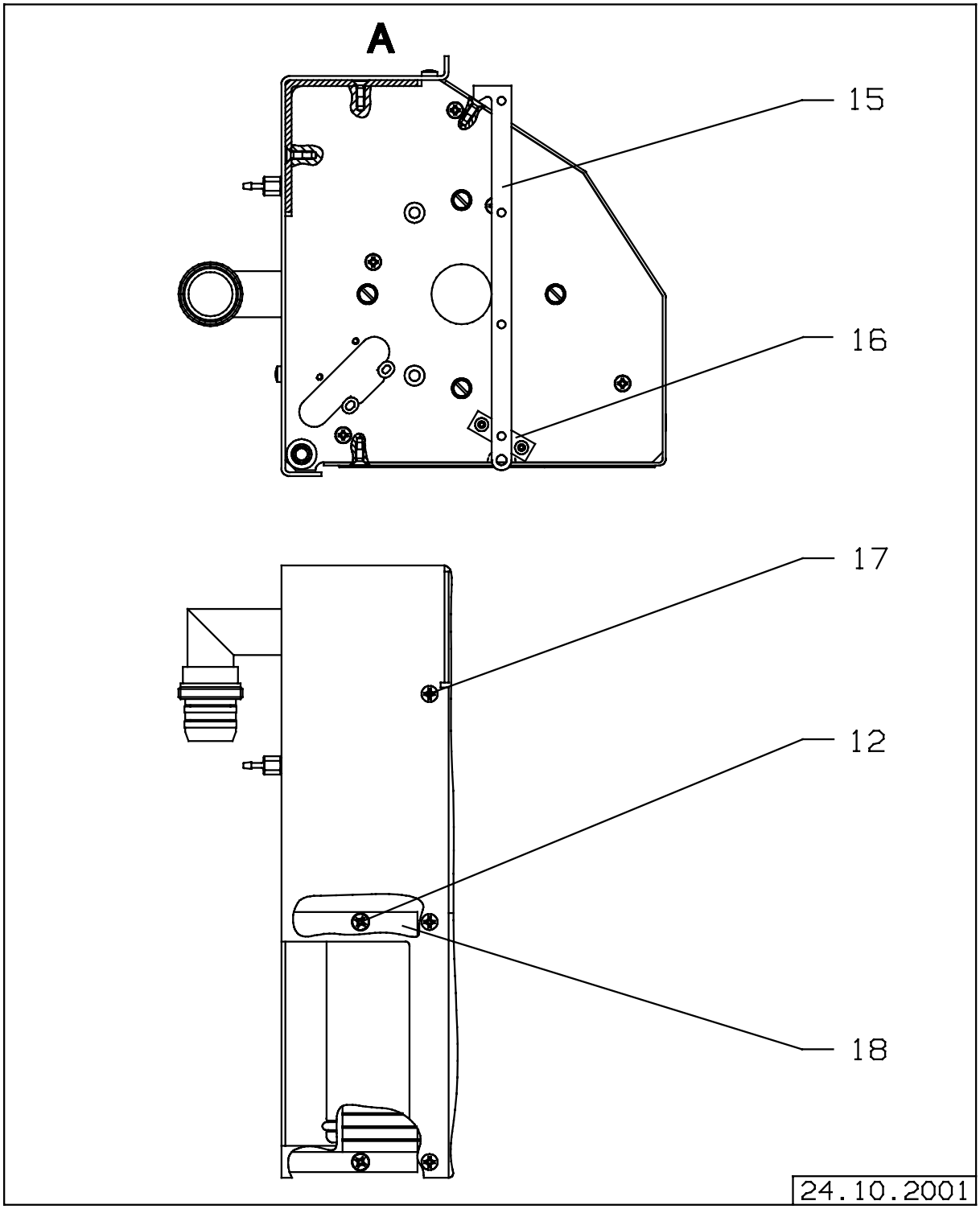
Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-18	CONTROL BOX 220V CONTROL BOX 220V	2600350		
1	LUEFTER, KOMPL. FAN, CPL.		2600397	
2	NETZLEITG.3,5M 3G1 CRSWDWN3043 SUPPLY MAIN 3,5M 3G1 CRSW		1836722	
3	KABELBAUM SCHALTER CABLE HARNESS SWITCH		2600399	
4	Z ENTST.FILTER 250/3 LV00204 INTERFERENCE FILTER 250/3	1814753		
5	TRAFO,KOMPL. TRANSFORMER,CPL.		2600369	
6	DREHKNOPF CONTROL KNOB		M29655	
7	KABELBAUM DREHSCHALTER CABLE HARNESS SNAP SWITCH		2600391	
8	BEST.LP POWER SUPPLY PCB POWER SUPPLY		8201971	
8	RAT-BEST.LP POWER SUPP(8201971 REP.EXCH.PCB POW.SUPPL(8201971		8201973	
9	KABELBINDER CABLE CLIP (2,4X92)		8712007	
10	RUESTSATZ SOFTWARE 02.00 FABIU MOD.KIT SOFTWARE 02.00 FABIUS		2600402	
11	BEST.LP LEISTUNG PCB POWER		8201951	
11	RAT-BEST.LP LEISTUNG (FABIUS) REP.EXCH.PCB POWER (8201951		8201953	
12	DISPLAY,KOMPL. DISPLAY,CPL.		2600374	
13	BEST.LP STEUERUNG PCB CONTROL SYSTEM		8201961	
13	RAT-BEST.LP STEUERUNG REP.EXCH.PCB CONTR.SYS(8201961		8201963	
14	NICD-AKKU 9V 100MAH NC STORAGE BATTERY 9V		8301856	
15	FOLIENTASTATUR KEY PAD		2600370	
16	DRUCKSENSOR 100 MBAR PRESSURE SENSOR 100 MBAR		1837311	

Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
17	DRUCKSENSOR +-4MBAR PRESSURE SENSOR +-4MBAR		1843060	
18	BEST. LP CONTROL. BOX FABIUS (OHNE ABBILDUNG) PCB ASM CONTROL. BOX FABIUS (WITHOUT ILLUSTRATION)		4116021	

VENTILATOR FÜR FABIUS **Bild/Picture 15**
VENTILATOR FABIUS



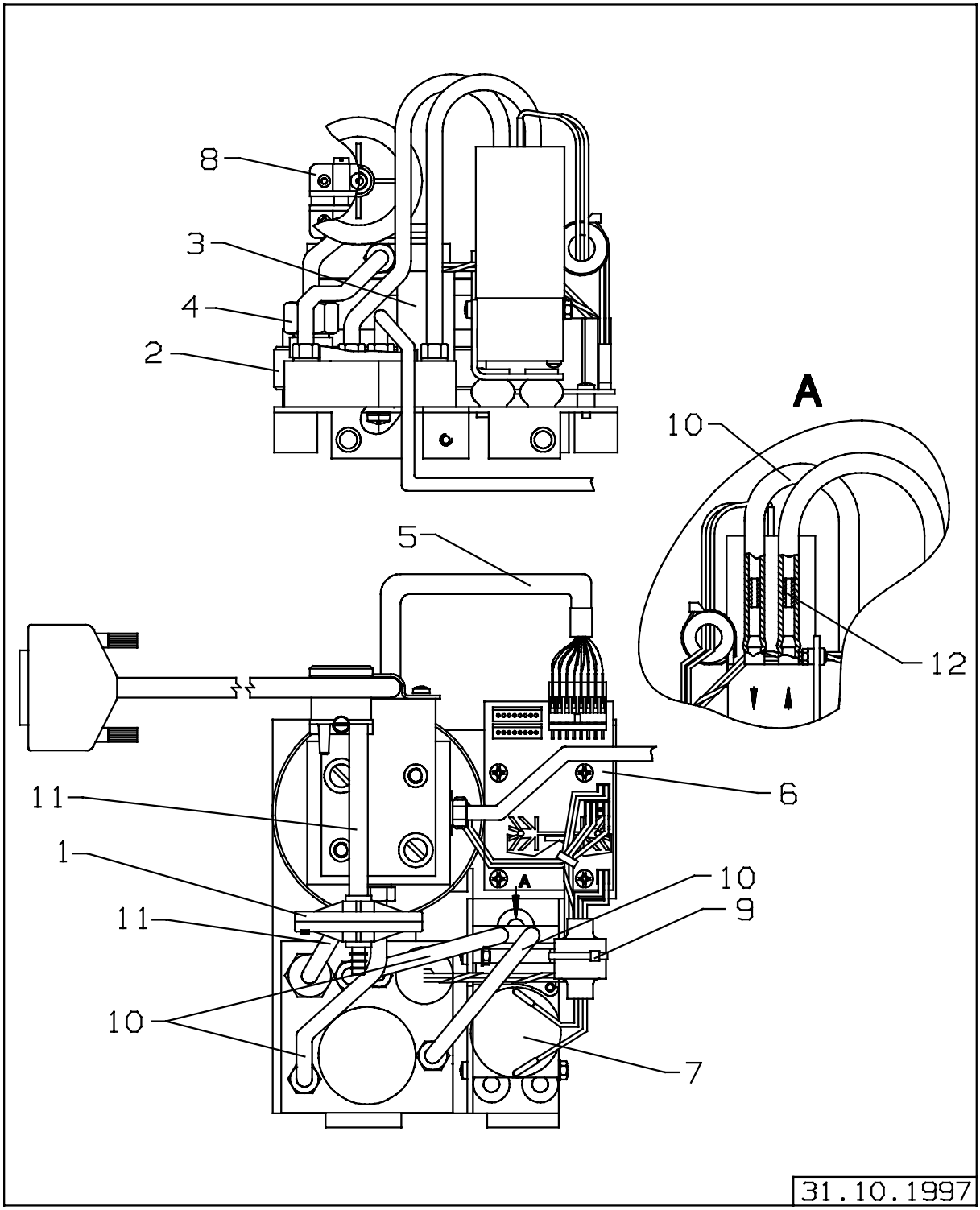
VENTILATOR FÜR FABIUS **Bild/Picture 16**
VENTILATOR FABIUS



Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-22	VENTILATOR,VOLLST. VENTILATOR COMPL.		2600600	
1	RUNDSCHNURRING O-RING SEAL		2M08777	
2	SPINDELAUFNAHME SPINDLE HOUSING		2600635	
3	KABELBAUM INKREMENTALGEBER CABLE HARNESS INCR.TRANSDUCER		2600657	
4	KABELBAUM LICHTSCHRANKE CABLE HARNESS LIGHT BARRIER		2600656	
5	SOCKET (TUELLE) SOCKET		2600653	
6	SICHERHEITSVENTIL SAFETY VALVE		2600680	
7	ZUSATZLUFTVENTIL ADDITIONAL AIR VALVE		2600670	
8	ANTRIEBSZENTRUM DRIVE ASSEMBLY		2600700	
9	O-RING TOROIDAL SEALING RING		G60337	
10	MEMBRAN, KOLBEN DIAPHRAGM, PISTON		2600651	
11	MOTOR/ BALL SCREW ASM - FABIUS MOTOR/ BALL SCREW ASM - FABIUS	4116391		
12	SENKSCHRAUBE DIN 965-M4X8 SCREW DIN 965-M4X8		1339958	
13	ROLLMEMBRAN,DECKEL DIAPHRAGM,CUP		2600650	
14	PATIENTENTEIL PATIENT PART		2600610	
15	BLECH FUER TUERANSCHLAG PLATE FOR DOORSTOP		2600665	
16	GUIDANCE (FUEHRUNG) GUIDE		2600666	
17	SENKSCHRAUBE DIN 7985-M4X8 SCREW DIN 7985-M4X8		1340778	
18	FENSTER WINDOW		2600603	
19	BLEIAKKUMULATOR 12V /3,5AH (OHNE ABBILDUNG) ACCU 12V 3,5AH		1841416	

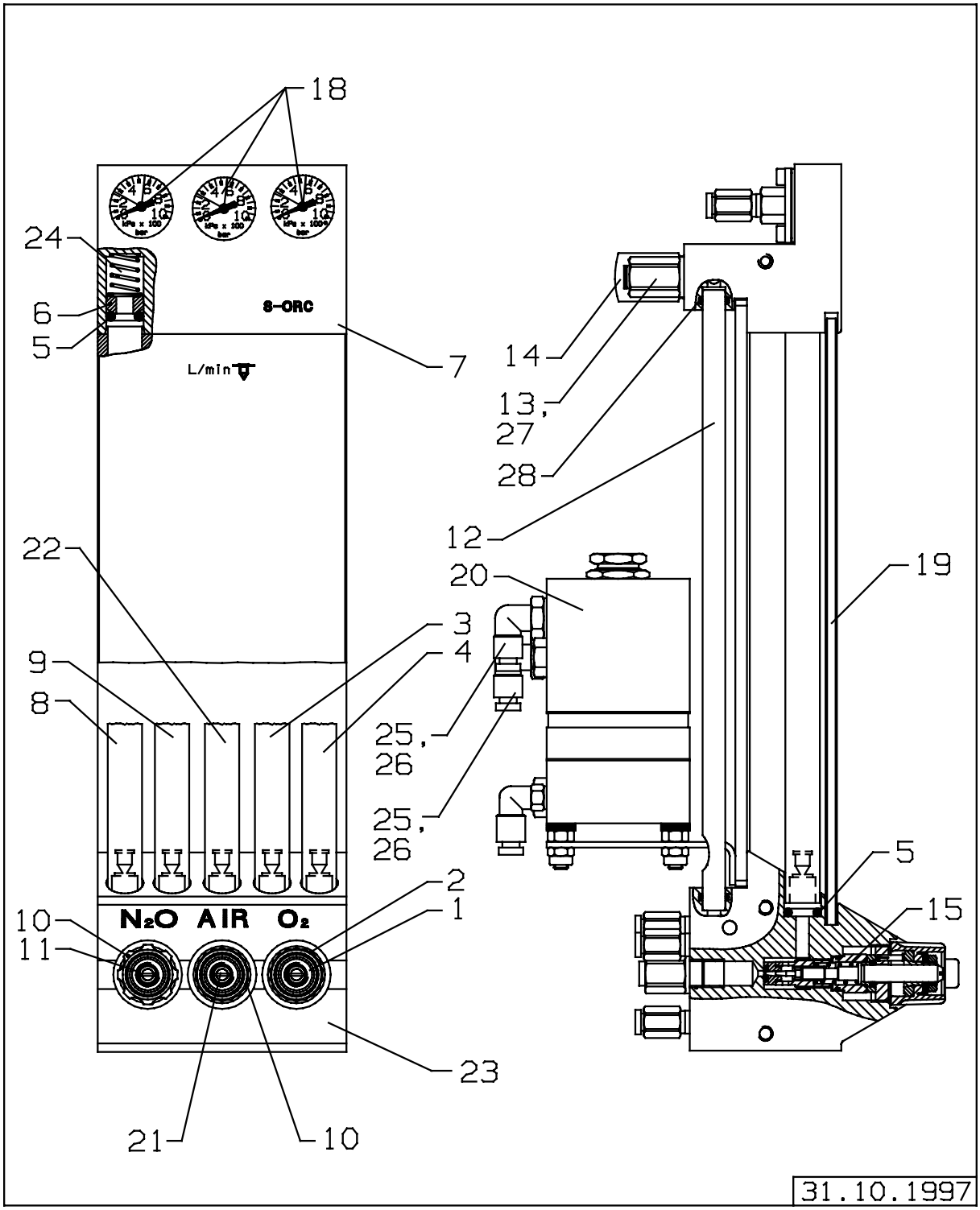
Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
	(WITHOUT ILLUSTRATION)			
20	SICHERUNGSEINS.DIN41662 T3,15A (OHNE ABBILDUNG) FUSE LINK DIN 41662 T3,15A (WITHOUT ILLUSTRATION)		1815148	10
21	SCHLAUCH 2-0,7M, LIVIUS SD (OHNE ABBILDUNG) HOSE 2-0,7M, LIVIUS SD (WITHOUT ILLUSTRATION)		M32701	
22	SCHRAUBENDREHER DWN622-B6X100 (OHNE ABBILDUNG) HEXAG.SCR.DRIVER DWN622-B6X100 (WITHOUT ILLUSTRATION)		1640623	

PNEUMATISCHE STEUERUNG **Bild/Picture 17**
PNEUMATIC CONTROL

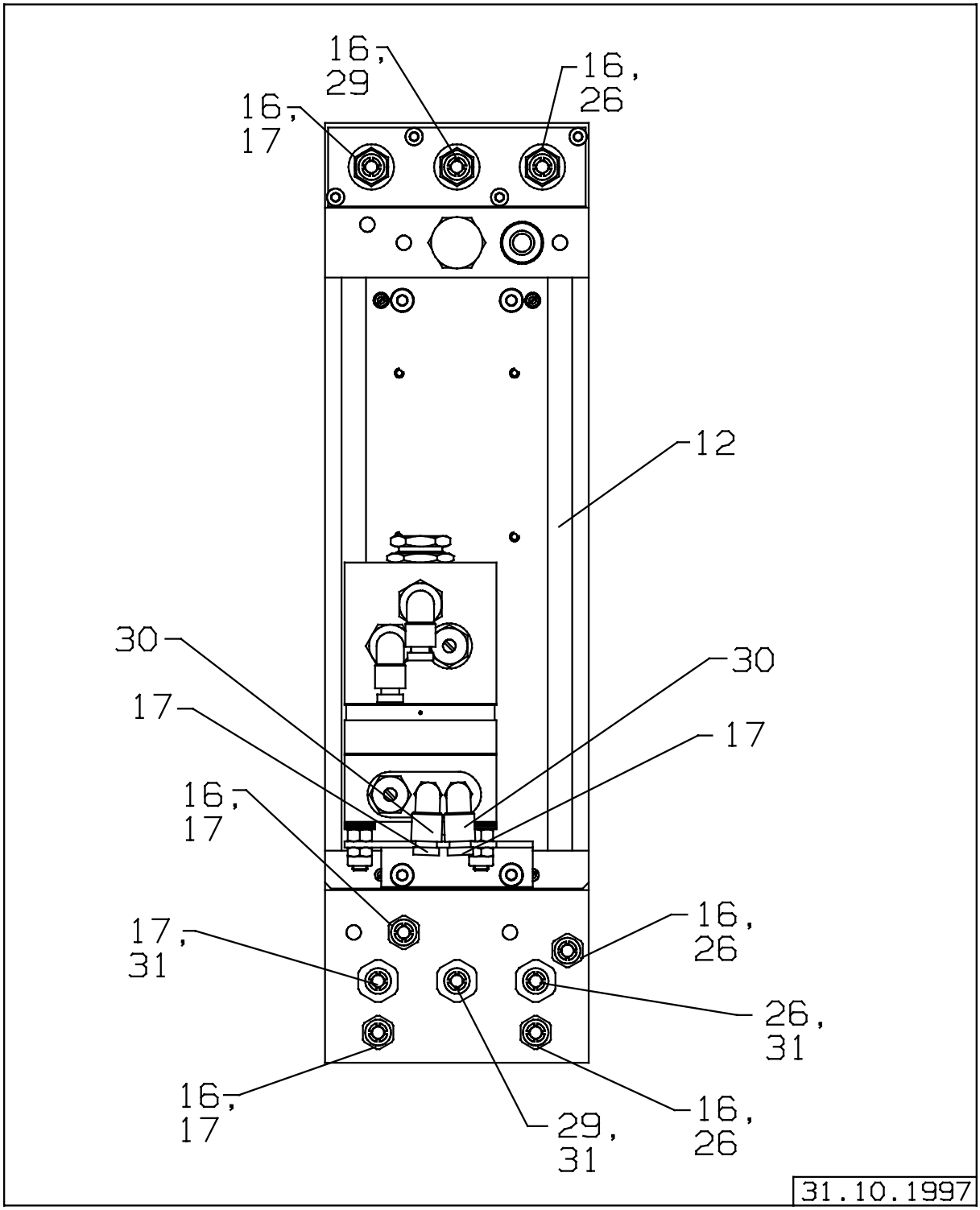


Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-12	PNEUMATISCHE STEUERUNG PNEUMATIC CONTROL	2600550		
1	BAKTERIENFILTER BACTERIA FILTER		8402868	
2	PEEP-VENTIL, KOMPL. PEEP VALVE, CPL.		2600573	
3	DRUCKSENSOR,KOMPL. PRESSURE SENSOR,CPL.		2600563	
4	DRUCKBEGRENZUNGSVENTIL PRESSURE CONTROL VALVE		2600570	
5	STEUERKABEL CONTROL CABLE		2600562	
6	BEST.LP PNEUMATIC PCB PNEUMATIC		8202081	
7	PUMPE,KOMPL. PUMP,CPL.		2600564	
8	VOLUMEN,VOLLST.6,3 ML UGR. VOLUME, CPL. 6,3 ML	8408765		
9	KABELBINDER CABLE CLIP (2,4X92)		8712007	
10	SCHLAUCH 4X1,5-SI 50 SH A NF HOSE 4X1,5-SI 50 SH A NF		1190520	
11	SCHLAUCH 2,5X2-SI NF 8409895 HOSE 2,5X2-SI NF 8409895	1207679		
12	SCHLAUCH 2X1-SIGN RT HOSE 2X1-SIGN RED		1204793	

FLOWMETER (3-GAS, US-STANDARD) **Bild/Picture 18**
FLOWMETER (3-GAS, US-STANDARD)



FLOWMETER (3-GAS, US-STANDARD) **Bild/Picture 19**
FLOWMETER (3-GAS, US-STANDARD)

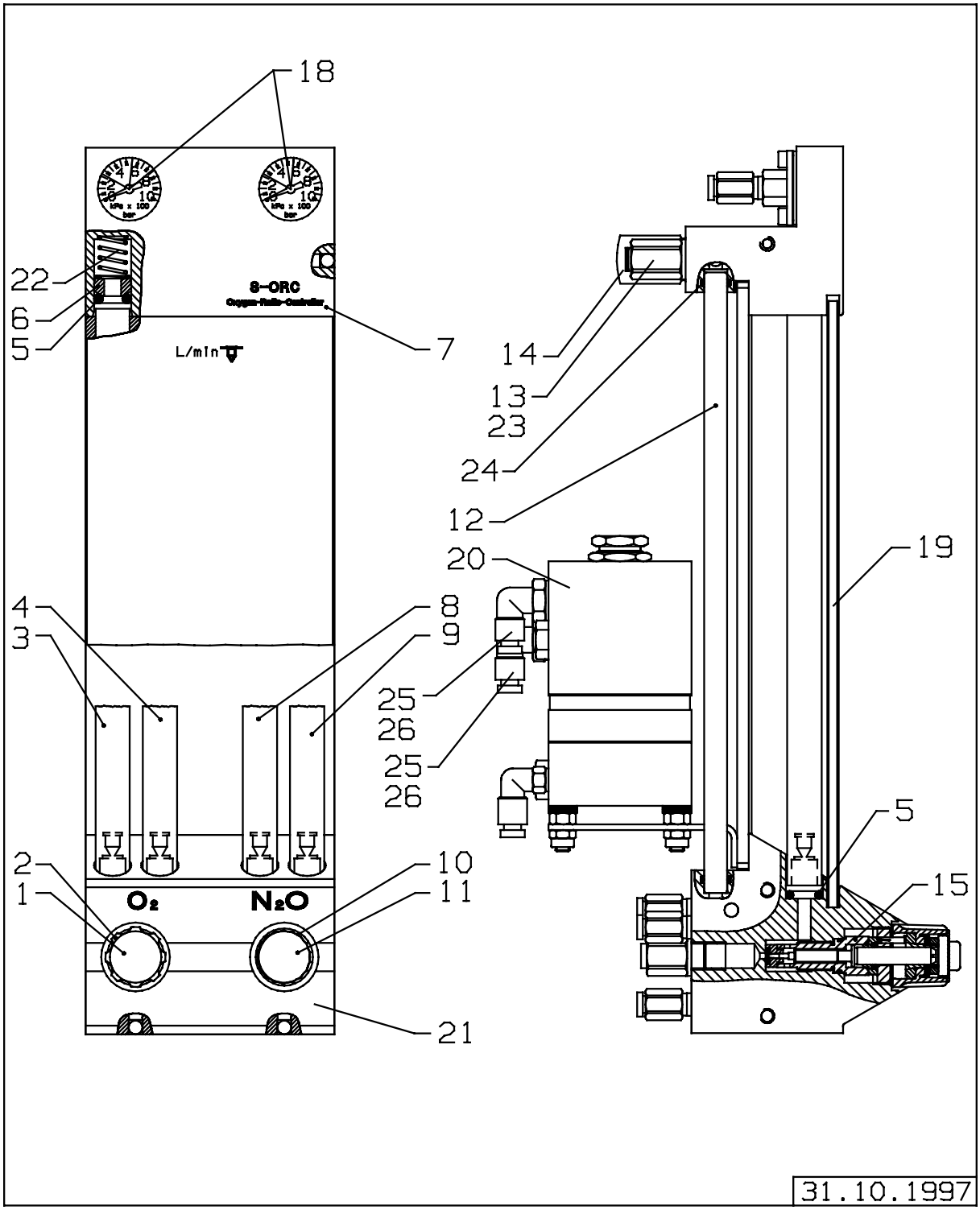


Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-31	FLOWMETER 3 GAS US-O2,N2O,AIR FLOWMETER 3 GAS US-O2,N2O,AIR	2603504		
1	KAPPE 1,GRUEN CAP 1,GREEN		M25147	
2	DREHKNOPF ISO,OHNE KAPPE KNOB A1, NOT CAP	2600309		
2	DREHKNOPF ISO,OHNE KAPPE CONTROL KNOB ISO, WITHOUT CAP		M31954	
3	MESSROEHRE FUER O2 METER TUBE FOR O2		M29391	
4	MESSROEHRE FUER O2 METER TUBE FOR O2		M29392	
5	O-RING O-RING SEAL		M34329	
6	FEDERLAGER HANGER	2600303		
7	ANSCHLUSS-STUECK, (OBEN) CONNECTING PIECE (TOPSIDE)	M33601		
8	MESSROEHRE FUER N2O METER TUBE FOR N2O		M29393	
9	MESSROEHRE FUER N2O METER TUBE FOR N2O		M29394	
10	DREHKNOPF A1 OHNE KAPPE KNOB ISO, NOT CAP	2600304		
10	DREHKNOPF A1,OHNE KAPPE CONTROL KNOB A 1 WITHOUT CAP		M25149	
11	KAPPE 1,BLAU CAP 1,BLUE		M24901	
12	ROHR TUBULE	2600317		
13	STECKANSCHLUSS PLUG-TYPE CONNECTION		M30960	
14	SICHERHEITSVENTIL SAFETY VALVE	2600310		
14	SICHERHEITSVENTIL SAFETY VALVE		M21683	
15	FEINREGELVENTIL-EINBAUSATZ E PRECISION CONTROL VALVE KIT E		M27010	
16	STECKANSCHLUSS PLUG-TYPE CONNECTION		M30952	

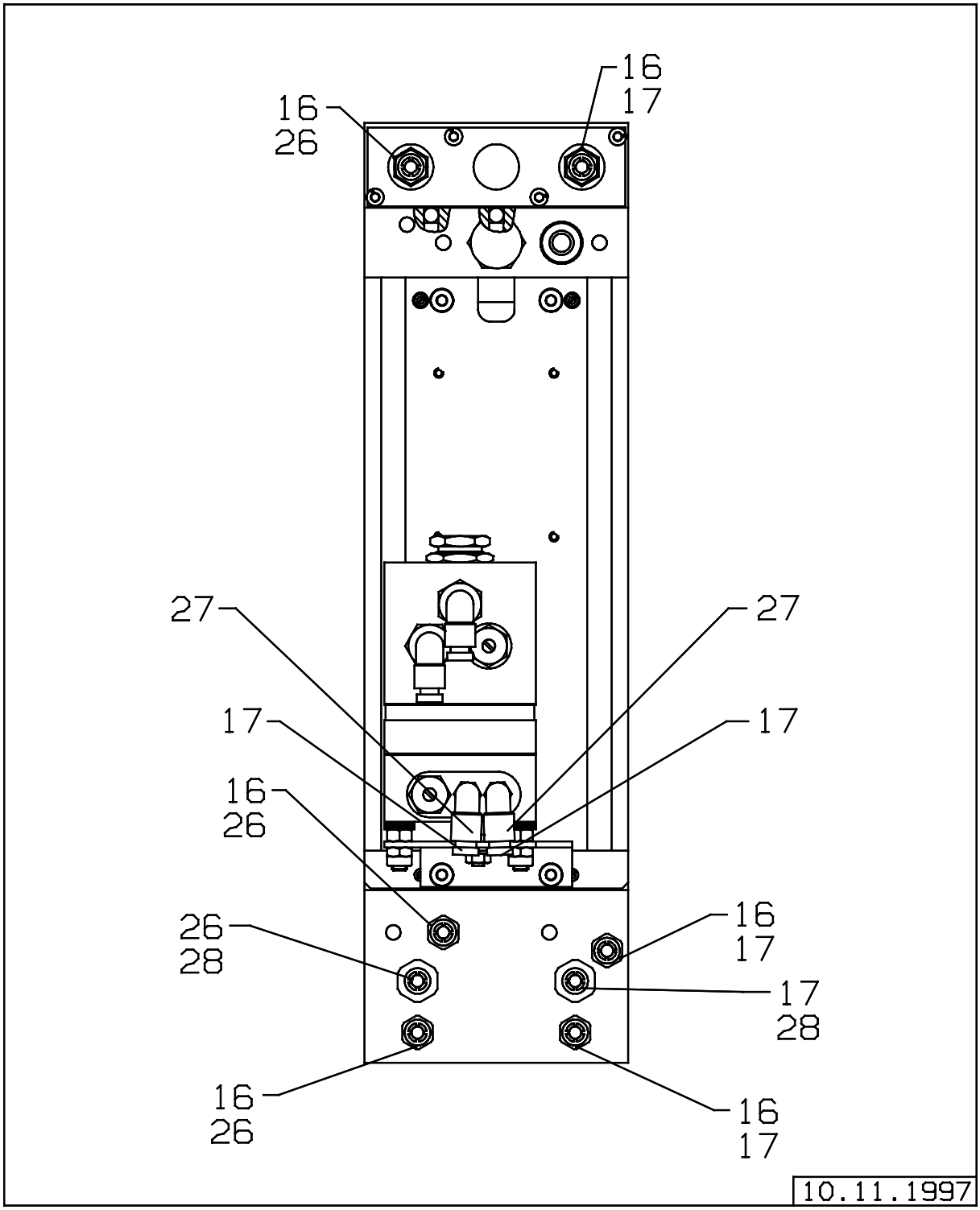
Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
17	DRUCKRING 4 MM,WEISS THRUST COLLAR 4, WHITE		M31602	
18	MANOMETER PRESSURE GAUGE		M33402	
19	SCHEIBE PANE		M30297	
20	S-ORC RELIEF VALVE		M32940	
21	KAPPE 1,GELB CAP 1,YELLOW		M25797	
22	MESSROEHRE FUER AIR METER TUBE FOR AIR		M27292	
23	ANSCHLUSZSTUECK,UNTEN CONNECTION PIECE, UNDERSIDE	M32641		
24	FEDER SPRING		M12928	
25	WINKELSTECKANSCHLUSS ANGLE CONNECTION		M30935	
26	DRUCKRING 4 MM,BLAU THRUST COLLAR 4, BLUE		M30937	
27	DRUCKRING DURCHM.6, WEISS THRUST COLLAR 6, WHITE		M31603	
28	O-RING O-RING SEAL		E20274	
29	DRUCKRING DM 4, SCHWARZ THRUST COLLAR 4, BLACK		M30963	
30	WINKEL-STECKANSCHLUSS ANGLE CONNECTION		M30953	
31	EINSCHRAUBANSCHLUSS SCREW-IN CONNECTION		M28816	

FLOWMETER (2-GAS)
FLOWMETER (2-GASES)

Bild/Picture 20



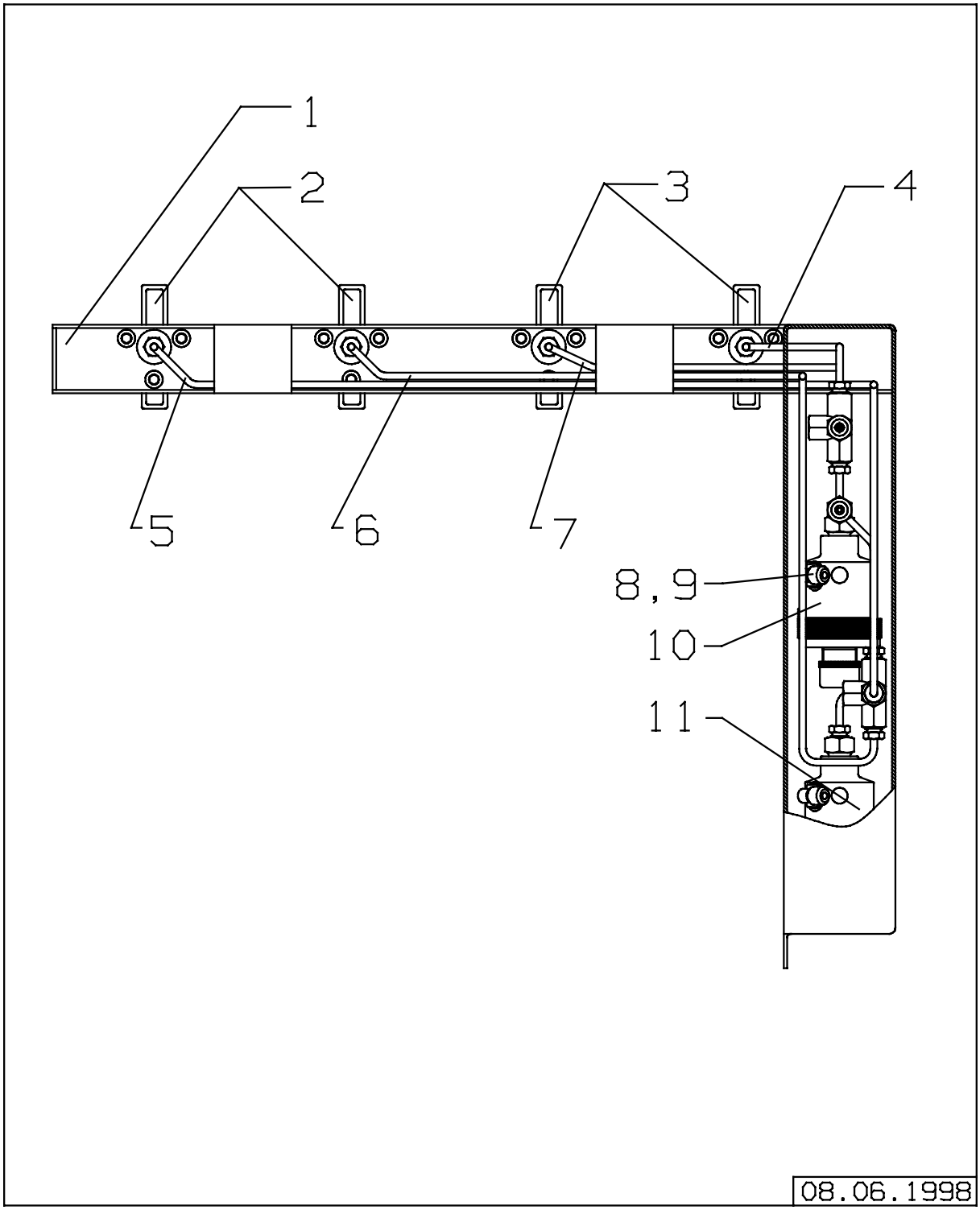
FLOWMETER (2-GAS) **Bild/Picture 21**
FLOWMETER (2-GASES)



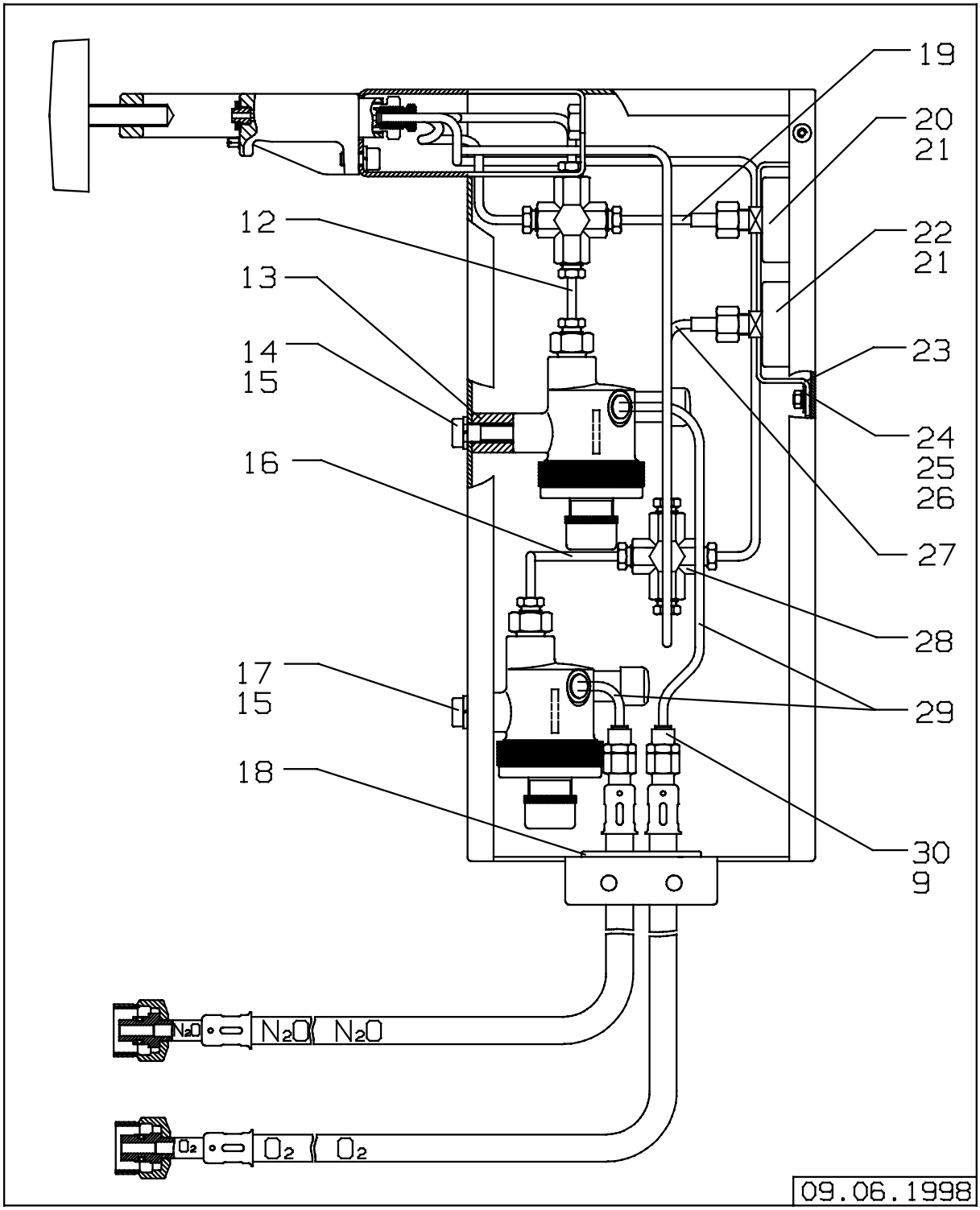
Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-28	FLOWMETER 2 GAS EURO-O2,N2O FLOWMETER 2 GAS EURO-O2,N2O	2600332		
1	KAPPE,WEISS CAP,WHITE		M25146	
2	DREHKNOPF ISO,OHNE KAPPE KNOB A1, NOT CAP	2600309		
2	DREHKNOPF ISO,OHNE KAPPE CONTROL KNOB ISO, WITHOUT CAP		M31954	
3	MESSROEHRE FUER O2 METER TUBE FOR O2		M29391	
4	MESSROEHRE FUER O2 METER TUBE FOR O2		M29392	
5	O-RING O-RING SEAL		M34329	
6	FEDERLAGER HANGER	2600303		
7	ANSCHLUSS-STUECK, (OBEN) CONNECTING PIECE (TOPSIDE)	M33601		
8	MESSROEHRE FUER N2O METER TUBE FOR N2O		M29393	
9	MESSROEHRE FUER N2O METER TUBE FOR N2O		M29394	
10	DREHKNOPF A1 OHNE KAPPE KNOB ISO, NOT CAP	2600304		
10	DREHKNOPF A1,OHNE KAPPE CONTROL KNOB A 1 WITHOUT CAP		M25149	
11	KAPPE 1,BLAU CAP 1,BLUE		M24901	
12	ROHR TUBULE	2600317		
13	STECKANSCHLUSS PLUG-TYPE CONNECTION		M30960	
14	SICHERHEITSVENTIL SAFETY VALVE	2600310		
14	SICHERHEITSVENTIL SAFETY VALVE		M21683	
15	FEINREGELVENTIL-EINBAUSATZ E PRECISION CONTROL VALVE KIT E		M27010	
16	STECKANSCHLUSS PLUG-TYPE CONNECTION		M30952	

Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
17	DRUCKRING 4 MM,WEISS THRUST COLLAR 4, WHITE		M31602	
18	MANOMETER PRESSURE GAUGE		M33402	
19	SCHEIBE PANE		M30297	
20	S-ORC RELIEF VALVE		M32940	
21	ANSCHLUSZSTUECK UNTEN CONNECTION PIECE, BELOW	2600301		
22	FEDER SPRING		M12928	
23	DRUCKRING DURCHM.6, WEISS THRUST COLLAR 6, WHITE		M31603	
24	O-RING O-RING SEAL		E20274	
25	WINKELSTECKANSCHLUSS ANGLE CONNECTION		M30935	
26	DRUCKRING 4 MM,BLAU THRUST COLLAR 4, BLUE		M30937	
27	WINKEL-STECKANSCHLUSS ANGLE CONNECTION		M30953	
28	EINSCHRAUBANSCHLUSS SCREW-IN CONNECTION		M28816	

FLASCHEN RUESTSATZ 4XPIN INDEX **Bild/Picture 22**
CYLINDER REPLACEM.4XPIN INDEX



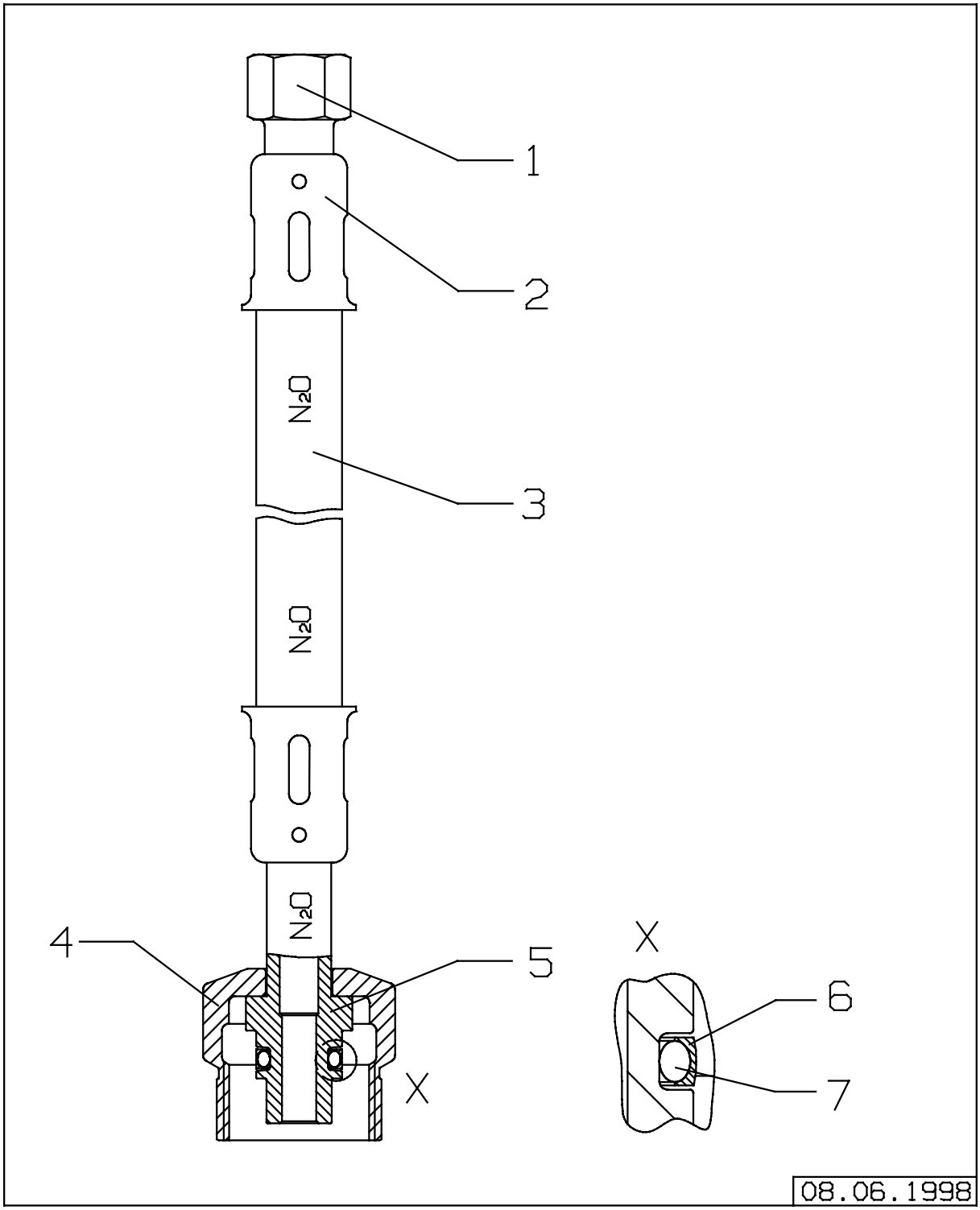
FLASCHEN RUESTSATZ 4XPIN INDEX **Bild/Picture 23**
CYLINDER REPLACEM.4XPIN INDEX



Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-30	FLASCHENRUESTSATZ PIN INDEX CYLINDER REPLACEM.4XPIN INDEX		2600420	
1	BLECH VOLLST. SHEET METAL, CPL.	2600427		
2	FLASCHENSPANNBUEGEL N2O CYLINDER CLAMP N2O	M28980		
3	FLASCHENSPANNBUEGEL O2 CYLINDER CLAMP O2	M28987		
4	ROHR TUBE	2600417		
5	ROHR TUBE	2600414		
6	ROHR TUBE	2600415		
7	ROHR TUBE	2600416		
8	WINKELSTECKANSCHLUSS ANGLE CONNECTION		M30961	
9	DRUCKRING 6 MM,SCHWARZ THRUST COLLAR 6, BLACK		M31601	
10	DRUCKMINDERER O2/AIR PRESSURE REDUCER	D40794		
11	DRUCKMINDERER PRESSURE REDUCER	D40795		
12	ROHR TUBE	2600412		
13	ABSTANDSHALTER SPACER	2600429		
14	M8X35 DIN 912-8.8/155 CHEESE HEAD SCREW M8X35 DIN912	1286412		
15	FEDERRING B 8,DIN127-NIRO SPLIT WASHER B8 DIN127-STAINL.		1333739	
16	ROHR TUBE	2600418		
17	M8X16 DIN 912-8.8/155 M8X16 DIN 912-8.8/155	1263536		
18	DURCHFUEHRUNG DUCT	2600434		
19	ROHR TUBE	2600413		

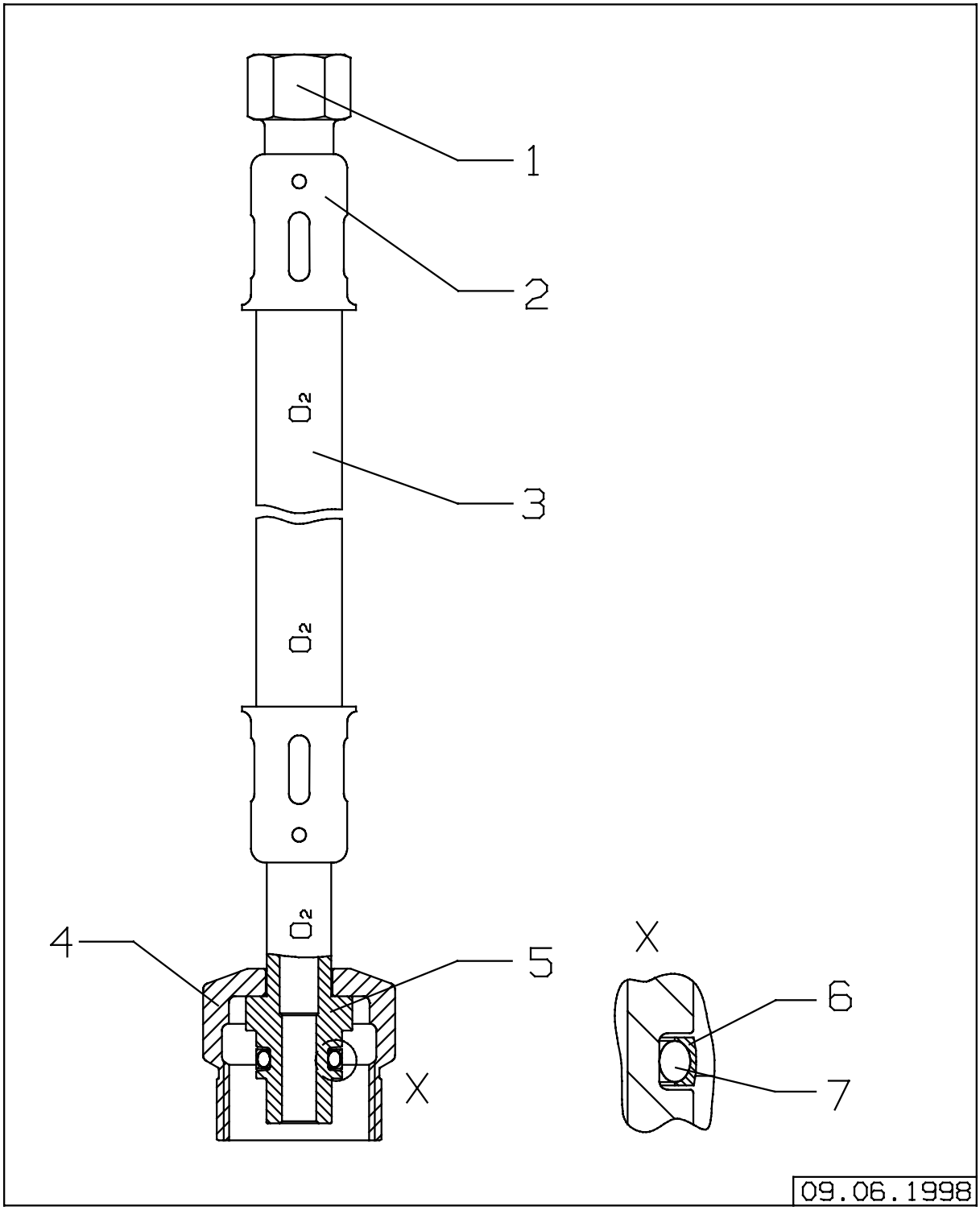
Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
20	MANOMETER F. O2 PRESSURE GAUGE FOR O2		M29398	
21	SICHTSCHEIBE DISC (PRESSURE GAUGE)	2600433		
22	MANOMETER F.N2O PRESSURE GAUGE FOR N2O		M29399	
23	BLECH SHEET METAL (PRESSURE GAUGE)	2600432		
24	B4,3 DIN 9021-A4 WASHER B 4,3 DIN 9021-A4	1331914		
25	FEDERRING B4 DIN127-X12CRNI177 SPLIT WASHER B4 DIN127-X12CRNI		1331345	
26	6KT.MUTTER M4 DIN934-A4/051 HEXAGON NUT M4 DIN 934-A4/051		1328956	
27	ROHR TUBE	2600419		
28	KREUZSTUECK CROSS PIECE	M21946		
29	SCHLAUCH 4X1 PAE NF HOSE 4X1 PAE NF		1210173	
30	STECKANSCHLUSS PLUG-TYPE CONNECTION		M30960	

SCHLAUCH FLASCHENVERSORGUNG N2O **Bild/Picture 24**
HOSE CYLINDER SUPPLY N2O



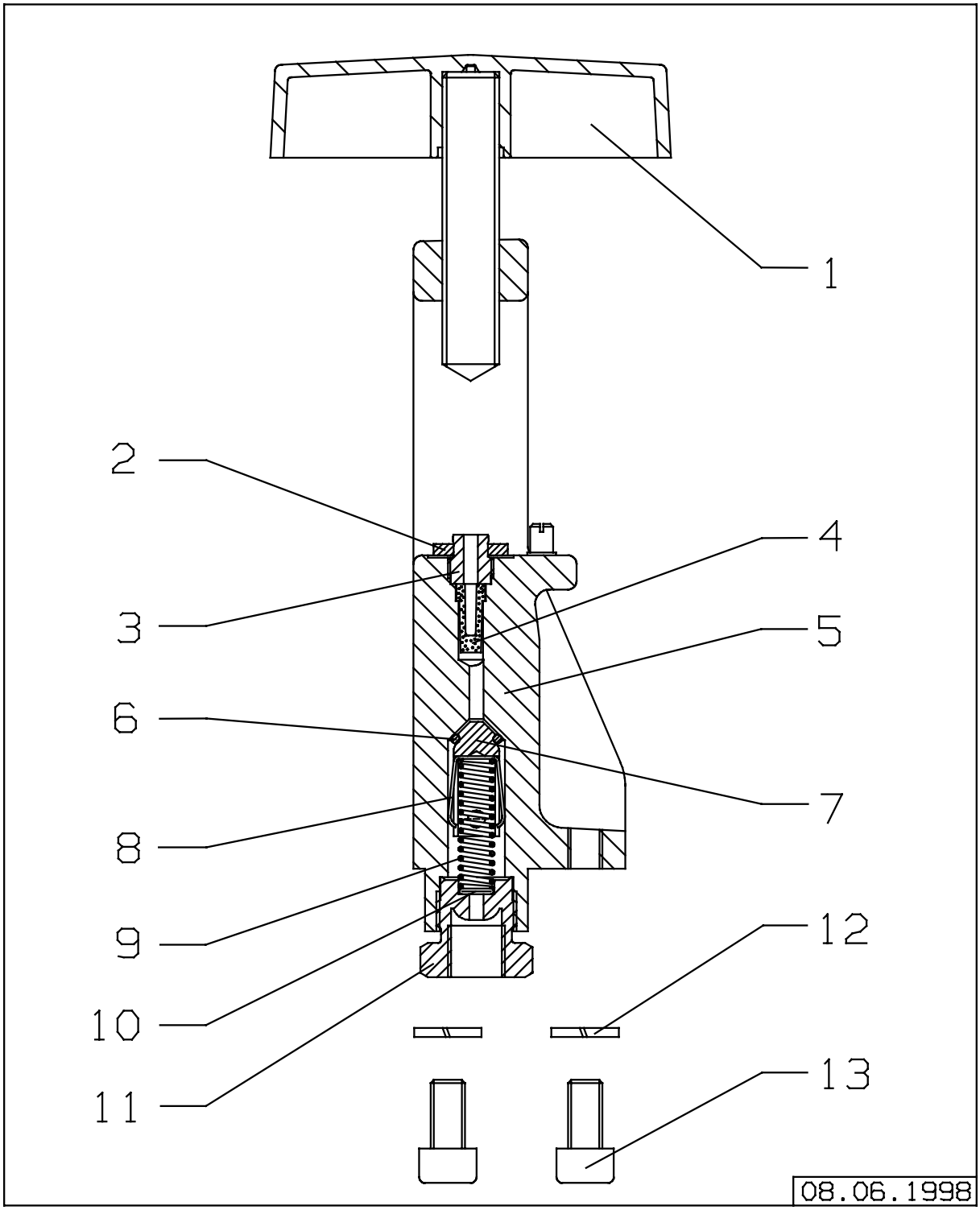
Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-7	SCHLAUCH FLASCHENVERSORGUNGN2O HOSE CYLINDER SUPPLY N2O	2600421		
1	TUELLE CONNECTING PIECE	2600423		
2	FASSUNG *SCHLAUCHHUELSE* HOLDER FOR HOSE SOCKET		M26950	
3	SCHLAUCH 6,3 SW N2O HOSE 6,3 N2O		1212346	
4-7	E-SET NIST N2O REP.SET NIST N2O		M32049	
4	UEBERWURFMUTTER UNION NUT	M27082		
5	TUELLE N2O NIST SOCKET N2O NIST	M27084		
6	DICHTRING PACKING RING		M32027	
7	O-RING O-RING SEAL		M13142	

SCHLAUCH FLASCHENVERSORGUNG O2 **Bild/Picture 25**
HOSE CYLINDER SUPPLY O2

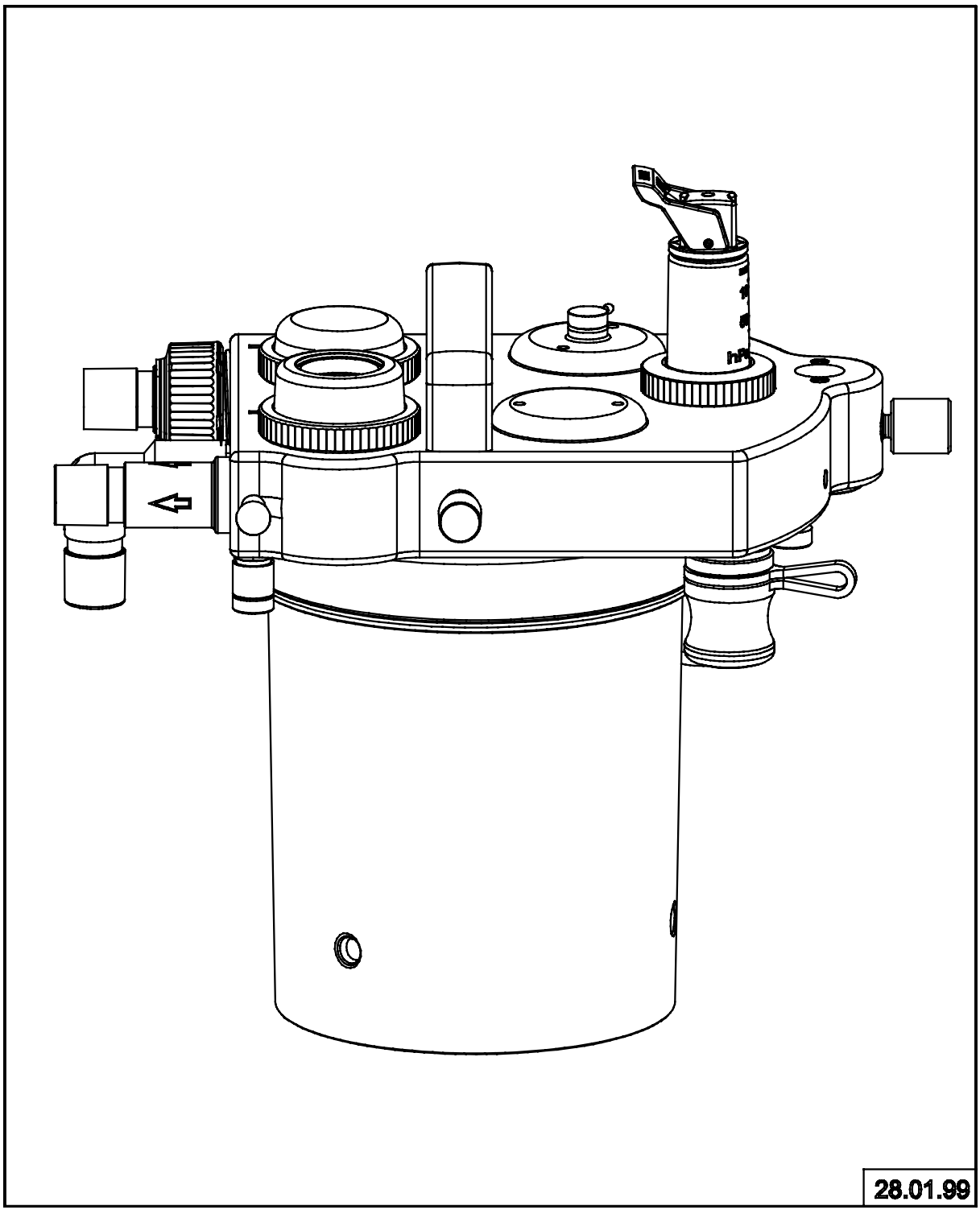


Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-7	SCHLAUCH FLASCHENVERSORGUNG O2 HOSE CYLINDER SUPPLY O2	2600422		
1	TUELLE CONNECTING PIECE	2600423		
2	FASSUNG *SCHLAUCHHUELSE* HOLDER FOR HOSE SOCKET		M26950	
3	SCHLAUCH 6,3 SW O2 HOSE 6,3 O2		1212303	
4-7	E-SET NIST O2 REP.SET NIST O2		M32048	
4	UEBERWURFMUTTER UNION NUT	M27082		
5	TUELLE O2 NIST SOCKET O2 NIST	M27083		
6	DICHTRING PACKING RING		M32027	
7	O-RING O-RING SEAL		M13142	

FLASCHENSPANNBÜGEL O2 **Bild/Picture 26**
CYLINDER CLAMP O2



Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-13	FLASCHENSPANNBUEGEL O2 CYLINDER CLAMP O2	M28987		
1-13	FLASCHENSPANNBUEGEL N2O CYLINDER CLAMP N2O	M28980		
1	KNEBELSCHRAUBE TOMMY SCREW		M18593	
2	DICHTRING PACKING RING		M05045	
3	DICHTRINGTRAEGER WASHER SUPPORT	M28988		
4	SINTERFILTER SINTERED FILTER		M23248	
5	SPANNBUEGEL O2 CLAMP CLIP O2	M28978		
5	SPANNBUEGEL N2O CLAMP CLIP N2O	M28979		
6	O-RING O-RING SEAL		E26833	
7	SCHLIESSBOLZEN CLOSING BOLT		M27639	
8	FEDER SPRING	M27641		
9	FEDER SPRING	M27677		
10	SIEBRING,VOLLST. SIEVE RING		R19562	
11	SPANNSCHRAUBE STRAINING SCREW	M28986		
12	FEDERRING B6 DIN 127-X12CRNI SPLIT WASHER B6 DIN127-X12CRNI	1333941		
13	M6X12 DIN 912-10.9/155 CHEESE HEAD SCREW M6X12 DIN912	1263196		


28.01.99

Diese Ersatzartikelliste gilt für Sachnummer:
This spare parts list is valid for part no.:

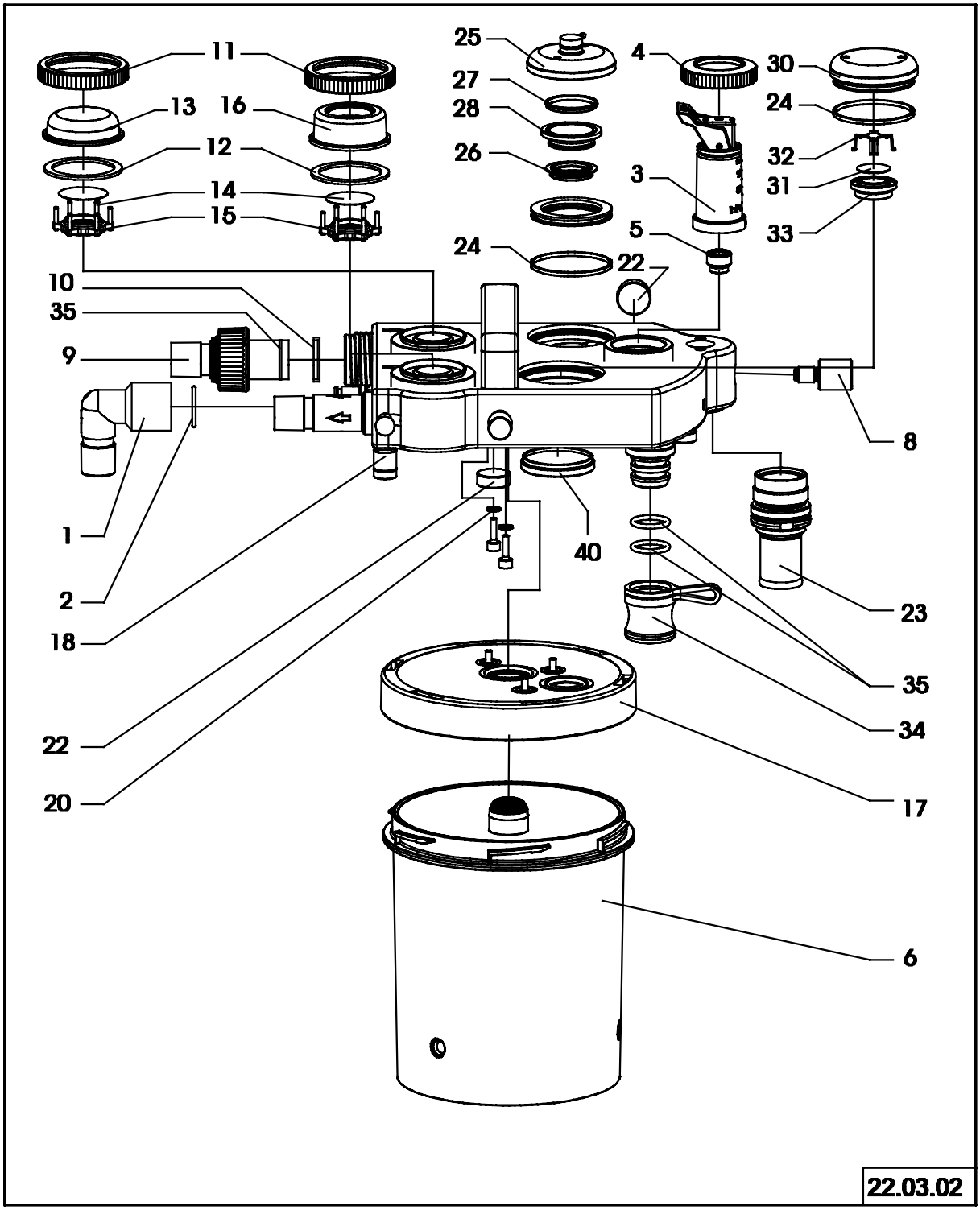
Sach-Nr. **Part No.**	**Benennung** **Description**
2600460	KOMPAKTATEMSYSTEM COSY COSY WITH ACCESSORIES

Inhaltsverzeichnis der Bilder
Summary of pictures

Bild **Picture**	**Bezeichnung** **Description**	**Sach-Nr.** **Part No .**	**E-Liste** **Spare parts list**
1	COMPAKTATEMSYSTEM COSY COMPACT BREATHING SYSTEM COSY	2600460	
2	ABSORBERDECKEL,VOLLST. ABSORBER TOP,CPL.	AF00495	
3	ABSORBER ABSORBER CICERO	M29320	

COMPAKTATEMSYSTEM COSY
COMPACT BREATHING SYSTEM COSY

Bild/Picture 1

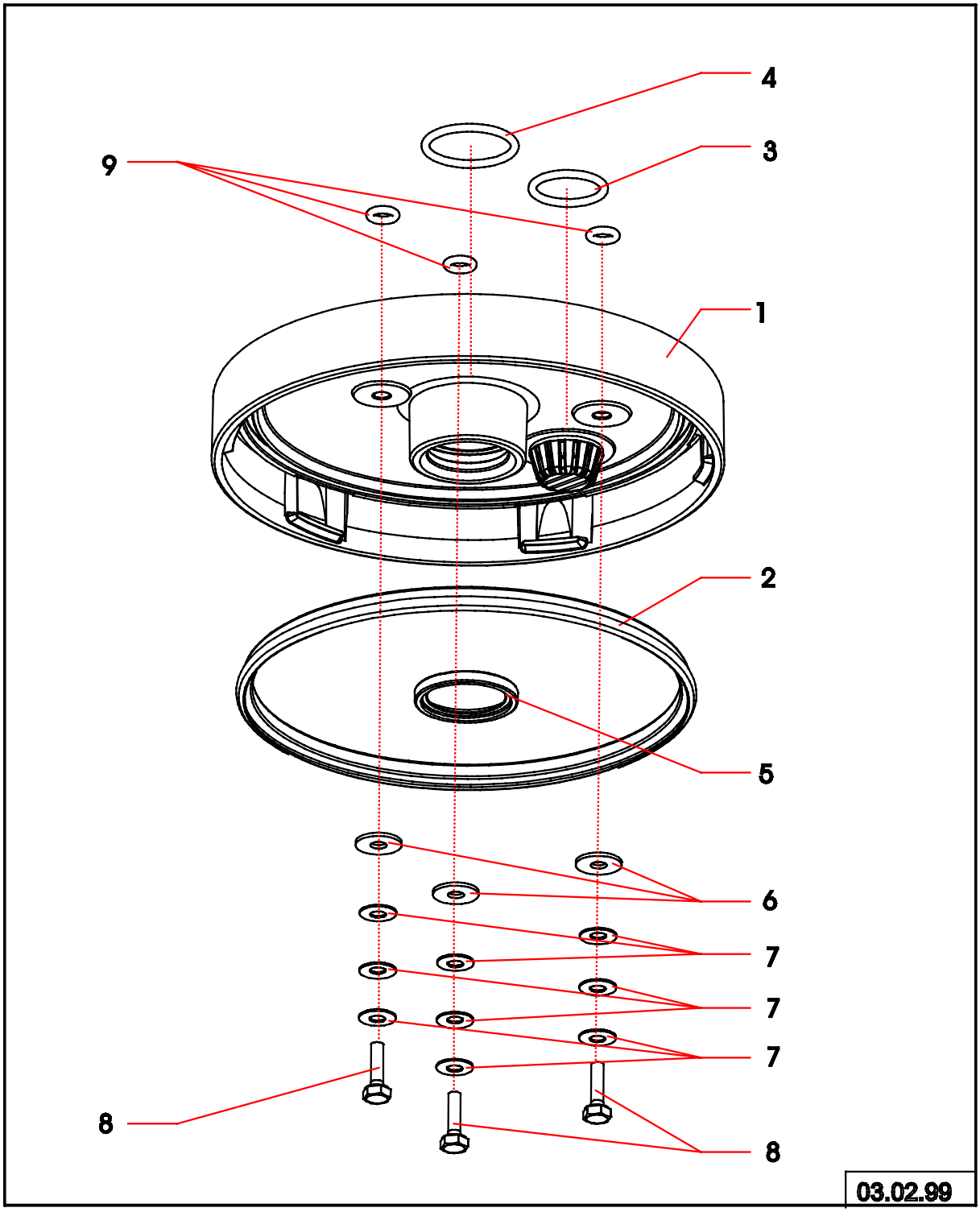


Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-39	KOMPAKTATEMSYSTEM COSY COSY WITH ACCESSORIES		2600460	
1-35	ATEMSYSTEM,VOLLST. COSY		2600741	
1	WINKELTUELLE,SW ANGULAR PORCELAIN BUSH		2600469	
2	O-RING O-RING SEAL		M20622	
3	APL-VENTIL,COSY APL-VALVE,COSY		2600457	
4	UEBERWURFMUTTER APL-VENTIL UNION NUT APL-VALVE		2600454	
5	KRATERSCHRAUBE CRATER SCREW		2600462	
6	ABSORBER ABSORBER CICERO		M29320	
8	KLEMMSCHRAUBE ADJUSTING SCREW		M20031	
9	EXSPIRATIONSTUELLE EXPIRATION BUSHING		2600463	
10	DICHTRING PACKING RING		2600477	
11	UEBERWURFMUTTER UNION NUT		M30453	
12	DICHTRING PACKING RING		M09231	
13	SCHAUGLAS CONTROL GLASS		M09230	2
14	VENTILTELLER VALVE DISK		M23225	3
15	VENTILKRATER VALVE CRATER		M30413	
16	KAPPE CAP		M21482	
17	ABSORBERDECKEL,VOLLST. ABSORBER TOP,CPL.		AF00495	
18	KUPPLUNG F.ATEMGAS COUPLING		M26238	
20	SCHEIBE MIT DICHTLIPPE WASHER WITH SEALING LIP		M30454	

Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
22	VERSCHLUSSCHRAUBE (M22X1) SCREW PLUG		2600461	
23	RUECKSCHLAGVENTIL NONRETURN VALVE		M32543	
24	O-RING O-RING SEAL		8603336	
25	VERSCHLUSZSCHRAUBE MIT TUELLE SCREW PLUG WITH NOZZLE		2600732	
26	VENTILKRATER VALVE CRATER(PEEP/PMAX-VALVE)		2600731	
27	BUCHSE SOCKET		M30384	
28	MEMBRAN DIAPHRAGM		8410181	2
28	DICHTSCHEIBE SEALING WASHER		8407979	10
28	TELLER PLATE		8407797	
30	VERSCHLUSZSCHRAUBE SCREW PLUG		2600734	
31	VENTILSCHEIBE VALVE REED		M31188	10
32	FEDERKREUZ SPRING CROSS		M17450	
33	KRATER CRATER		2600737	
34	KAPPE CAP		M33972	
35	RUNDSCHNURRING O-RING SEAL		2M08777	
36	Y-STUECK ERWACHSENE ohne Abbildung Y-PIECE ADULT without illustration		M25682	
37	DOPPELTUELLE 22/22 ohne Abbildung NOZZLE 22/22 without illustration		M25647	
38	ATEMSCHLAUCH E 110CM LG.MUFFE ohne Abbildung BREATH.HOSE LONG 110CM SLEEVE without illustration		2166038	

Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
39	ATEMBEUTEL 2,3L ISO ohne Abbildung BREATHING BAG 2,3L without illustration		2165708	
40	VERSCHLUSSCHRAUBE SCREW PLUG		2600730	
41	AUFNAHME (OHNE ABBILDUNG) HOLDER COSY (WITHOUT ILLUSTRATION)		8604163	
42	VENT BYPASS KIT-COSY (OHNE ABBILDUNG) VENT BYPASS KIT-COSY (WITHOUT ILLUSTRATION)		4116256	
43	FLOWSENSORABSCHIRMUNG FÜR COSY IM NMR-BEREICH (OHNE ABBILDUNG) FLOW SENSOR SHIELDING FOR COSY INTO NMR-RANGE (WITHOUT ILLUSTRATION)		M35168	

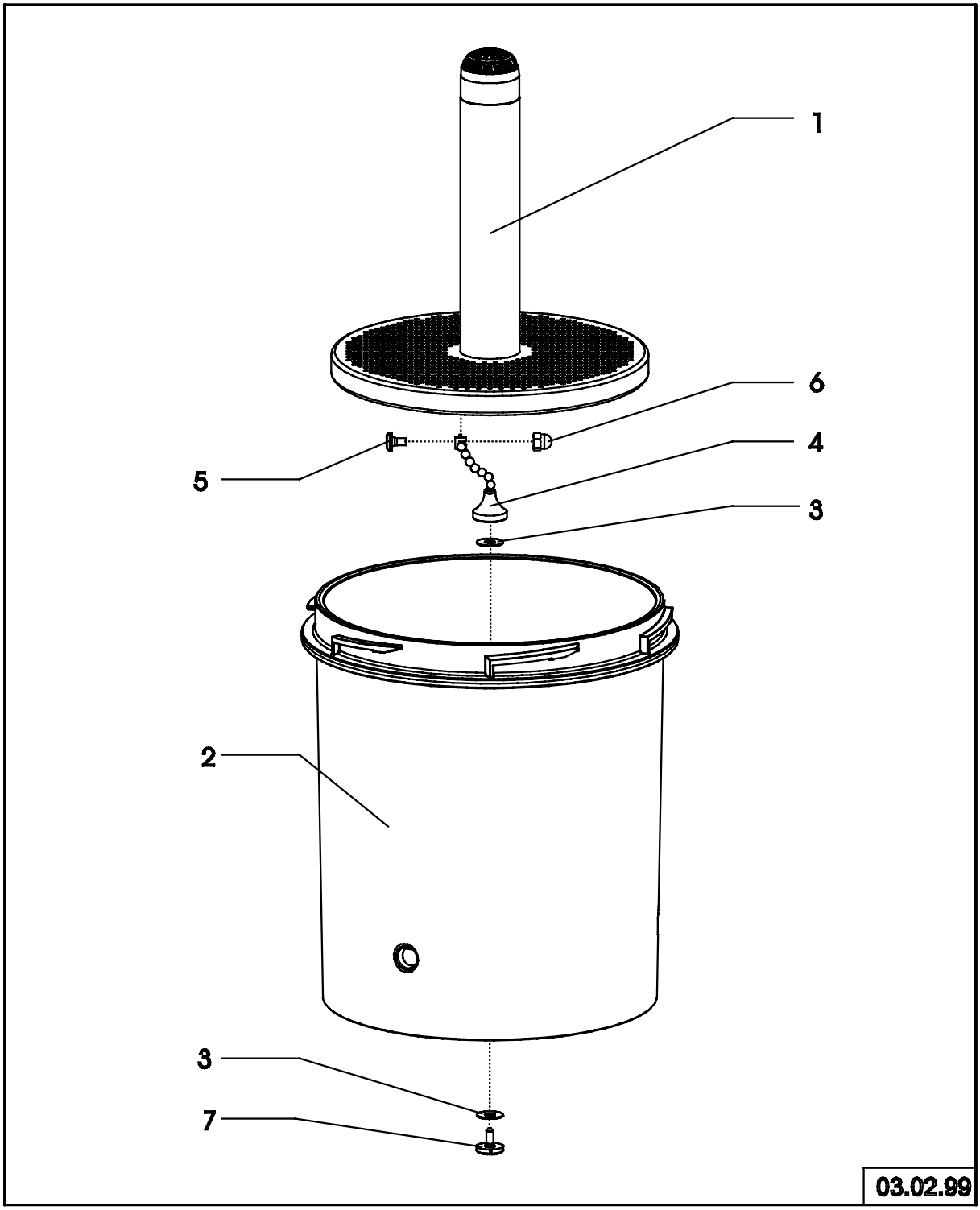
ABSORBERDECKEL,VOLLST. **Bild/Picture 2**
ABSORBER TOP,CPL.



Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-9	ABSORBERDECKEL,VOLLST. ABSORBER TOP,CPL.		AF00495	
1	ABSORBERDECKEL ABSORBER TOP		M33013	
2	LIPPENDICHTUNG LIP SEAL		M30455	
3	O-RING 23,47X2,62 O-RING SEAL		R50313	
4	O-RING TOROIDAL SEALING RING		R18352	
5	DICHTRING PACKING RING		M30456	5
6	B5,3 DIN 9021-A4 WASHER B 5,3 DIN 9021-A4		1329472	
7	TELLERFEDER SPING WASHER		2600459	
8	M5X16 DIN 933-A2 SCREW M5X16 DIN 933-A2		1266225	
9	O-RING O-RING SEAL		4302469	

ABSORBER
ABSORBER CICERO

Bild/Picture 3



Position Item No.	Benennung Description	Sach-Nr. Part No.	Bestell-Nr. Order-Code	Packung Quantity
1-7	ABSORBER ABSORBER CICERO		M29320	
1	ABSORBEREINSATZ ABSORBER INSERT		M29999	
2	ABSORBERTOPF ABSORBER POT		M29994	
3	DICHTRING PACKING RING		M30563	
4	KUGELKETTE,UGR. BEAD CHAIN		M30562	
5	AM4X6 DIN 85-A4/051 OVAL HEAD SCREW AM4X6DIN85-A4		1315838	20
6	HUTMUTTER M4DIN1587-M A4/051NG CAP NUR M4 DIN 1587-M A4/051		1334751	
7	M4X8 DIN 921-A2 SCREW M4X8 DIN 921-A2		1336029	100

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